The AUTOMOBILE

NEW YORK, APRIL 17, 1913

WHEN THE SALESMAN SAYS

"This car is equipped with

GRAY & DAVIS

Electric Starter, Lighting Dynamo and Electric Lamps"

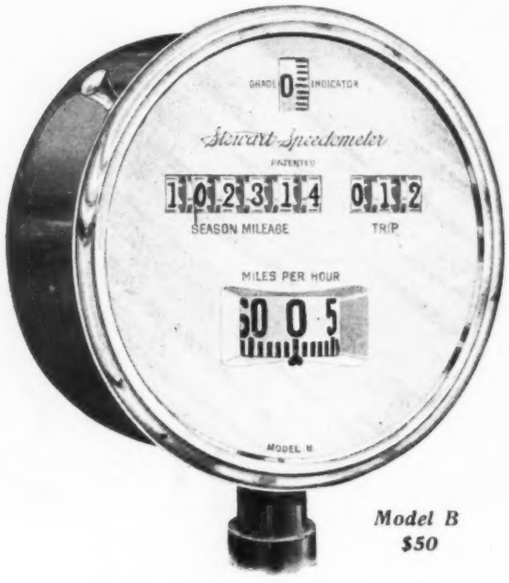
That's all you need to know about the car. In other words, you have visual, concrete evidence regarding the QUALITY of the car itself, and you can purchase such an automobile with the knowledge that you have the best.

GRAY & DAVIS, Inc., 55 Lansdowne St., BOSTON, MASS.

Manufacturers of Automobile Lamps, Dynamos and Electric Starters.

Stewart Speedometer

MAGNETIC PRINCIPLE



Model B
$50

More Practical—More Popular—More Prestige

It is estimated that about 450,000 cars will be built during 1913. Of this amount 400,000 will be equipped with a magnetic speedometer—like the Stewart.

The point is, that it is much better to have your car equipped with that which is acknowledged to be the most practical and scientific, rather than to have on it something that was considered the best before the magnetic speedometer was invented.

The magnetic speedometer means entire satisfaction and world wide service for all time.

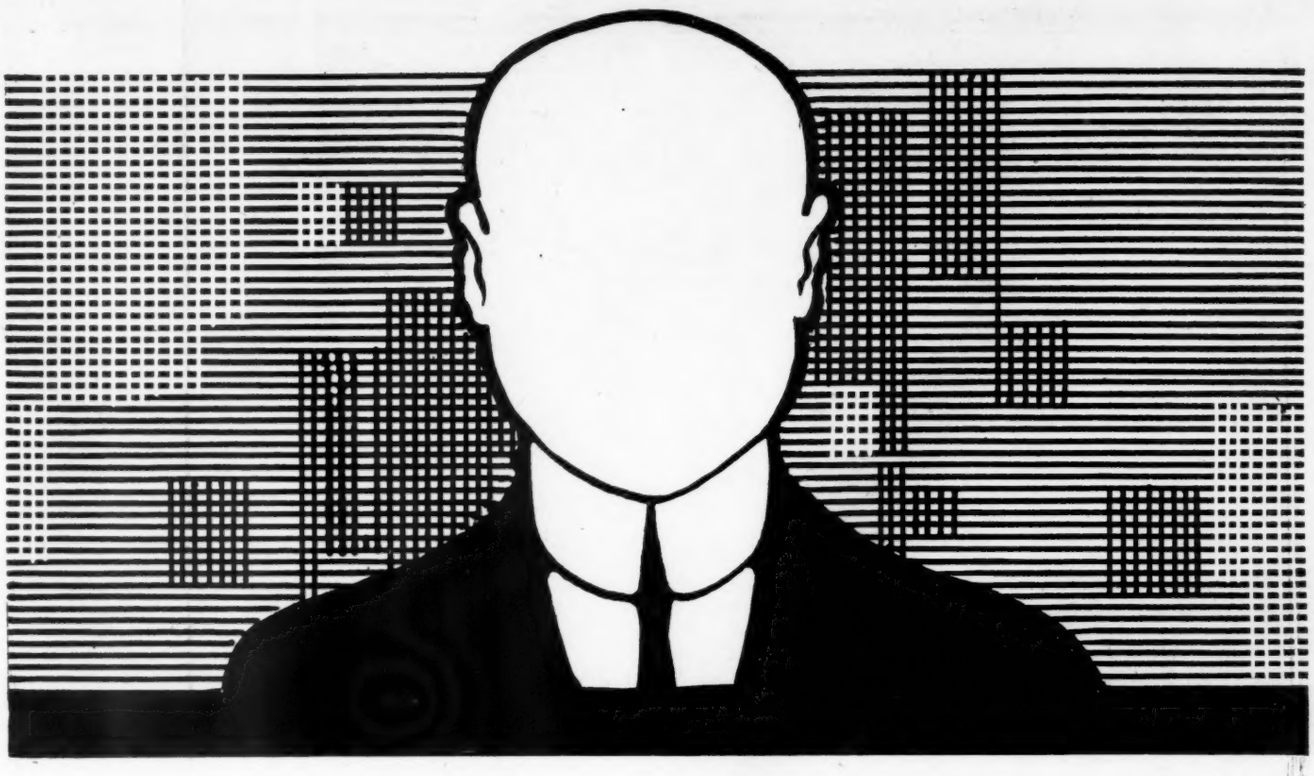
The centrifugal speedometer means all the old inaccuracies such as shaft troubles, etc., and no service.

And the gyroscopic speedometer is, of course, exactly the same as the old familiar and inaccurate centrifugal speedometer in a new dress and design.

Insist on a Stewart—it is built on the magnetic principle.

The Stewart Speedometer Factory,
1930 Diversey Blvd.
Chicago, U. S. A.

Service Stations in every important city in the world



Some big manufacturer needs me

My name or picture would be recognized not only by every car and parts manufacturer, but also by the leading dealers of this country.

So for the purpose of this announcement I wish to be known as X Y Z.

My connection with the industry dates back 15 years. I have a record of achievement that ranks me with the five most successful sales managers in the motoring world.

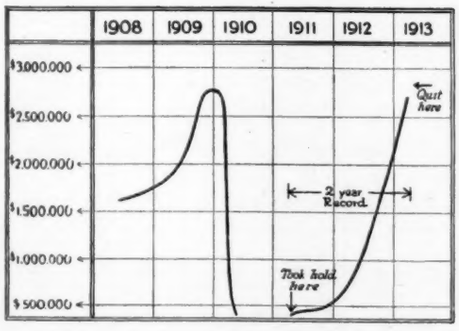
This record began by importing on a large scale European automobile parts and selling them to America's leading car makers.

I introduced to the American market what was probably the most successful accessory manufactured abroad.

In 1908 I designed and built the most successful vehicle of a certain type, and sold $1,250,000 worth of them from blue prints. This vehicle is still the standard in its field.

I am a *sales specialist*, and have used my thorough technical training as a basis for my sales work.

My last record as an organizer of sales is best indicated by this chart:



I believe I know how to judge the demand of the public and how best to take advantage of it.

There are perhaps a half dozen big unfinished jobs in the motor industry which my long experience and ability equip me to handle.

Is there one in your organization?

If you think it is large enough for a man who can do big things, it will pay you to write to me. I have well-defined views on the art of marketing products in the automobile industry. Perhaps my selling ideas are just what your business needs.

The *right* connection concerns me more than the question of salary. I will stand or fall on the results of my work. All correspondence will be treated with the utmost confidence.

I have adopted this means of announcing myself so that private interviews may be arranged between interested parties and myself without embarrassment to either side.

X Y Z Care of The Class Journal Co., 239 West 39th St., N. Y.

Most Electric Starters Increase Tonnage of Cars

Motor cars are increasing in tonnage at a disturbing rate. Only one or two makers, apparently, are directing their efforts toward lighter weight cars.

Addition after addition has been made until now many cars are under-tired and the additional weight is threatening the safety of the car's design.

Of all equipment to become standard for automobiles the Electric Lighting and Starting System weighs the most. It is natural then, that manufacturers and engineers should turn their attention to the lightest and most powerful electric starter ever offered.

The Hartford Electric Lighting and Starting System *complete* weighs no more than the starting motor *alone* on many other systems.

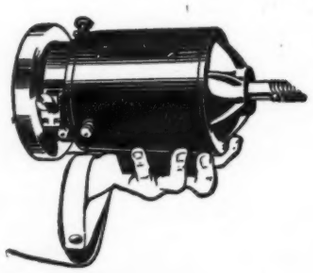
Completely installed, its weight is not enough to seriously affect either the tires, the chassis or any part of the car.

Combined with its wonderful lightness is its unequalled power and noiseless operation, secured by the use of a reduction gear and worm drive.

In view of these facts, is it not to your interest as well as ours to test the Hartford Electric Starter?

Our corps of expert engineers will attach the Hartford System to any car you may have available without a single structural change. Catalog on request.

Hartford Electric Starter



Every Buyer Should Specify the Hartford Starter for His New Car

HARTFORD SUSPENSION CO.

EDWARD V. HARTFORD, Pres.

Office and Works: Jersey City, N. J. Dealers Everywhere. Offices in all Principal Cities

Makers of the Truffault-Hartford Shock Absorbers

The AUTOMOBILE
THE CLASS JOURNAL COMPANY
231–241 W. 39th STREET NEW YORK CITY

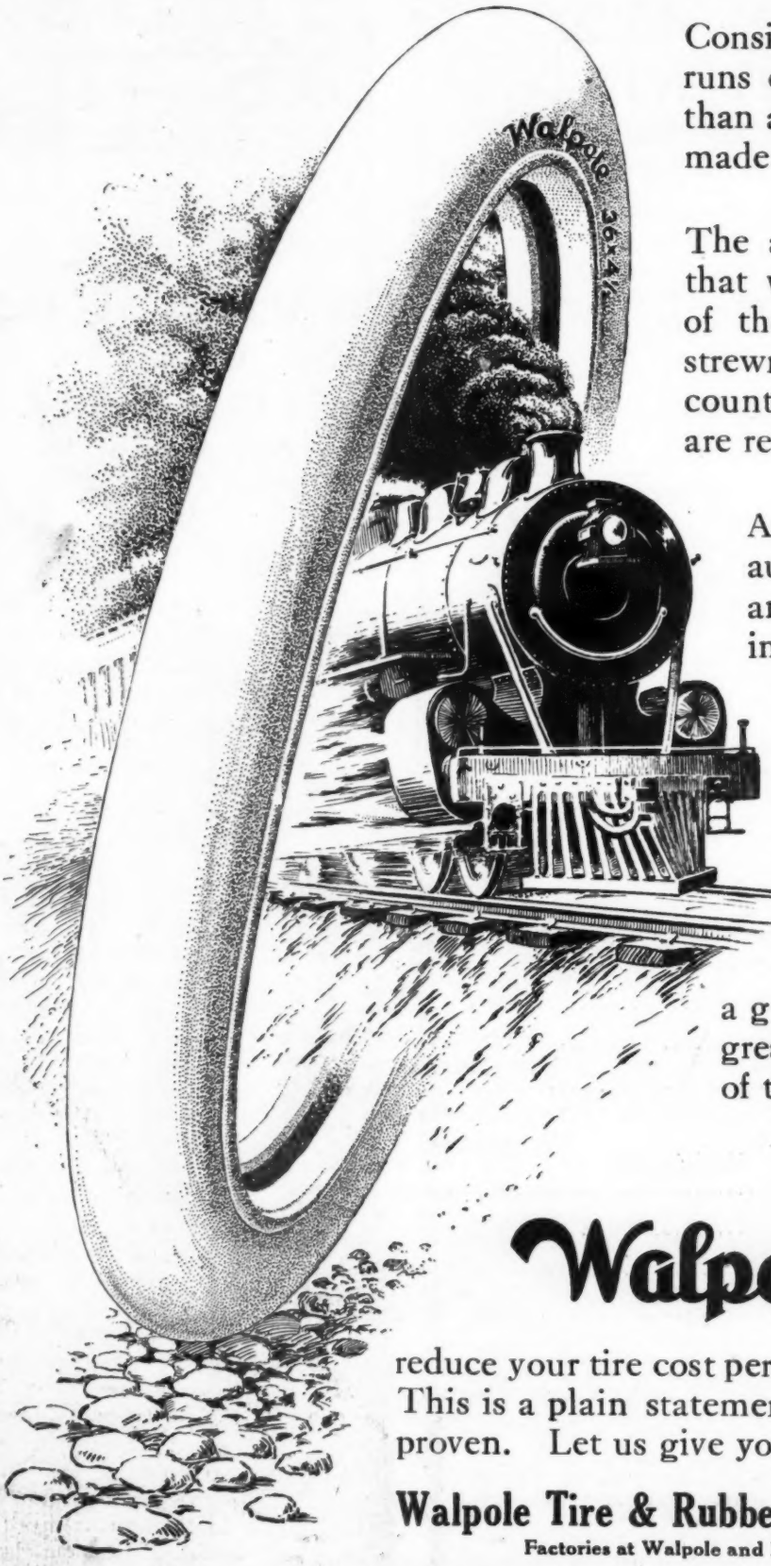
TABLE of CONTENTS

VOL. XXVIII NEW YORK, APRIL 17, 1913. No. 16

Detecting Resistance—Saving Fuel 833
Goux Makes 106.2 Miles in 60 Minutes 836
Bill to Tax Trucks $5 a Ton in Bay State 837
Miller to Double Stock 838
Big February Exports 839
Motor Spirit on Test 840
Grinnell Builds Trucks 841
French Army Truck Tests 842
Non-Poppet Motors Influence Poppet Types 844
The Engineering Digest 846
The Engineers' Forum 849
Design for Runabout Body With Doors 850
Quick Painting of Metal Bodies 851
Stearns Model Service and Inspection 852
The Rostrum 856
Maximum Weight Carried by Car
Adjusting Carbureter on Winton
Theory of Correct Steering
Pressure Gasoline System Explained
Interested in Trip to Quebec
Schebler Carbureter Curves
The Rear Axle Gearbox 860
Bennett Rear Gearbox 861
Editorial: Different Tire Prices 862
Welfare in Factories.
The House Organ 863
Maxwell 25 Is Out 864
Accessories for the Automobilist 866
Factory Miscellany 870
The Automobile Calendar 871
The Week in the Industry 872
New Agencies Established During the Week 873
Automobile Incorporations 874
Automobile Patents 876
Index to Advertisers 50-51

DELCO
ELECTRIC SELF CRANKING ELECTRIC LIGHTING AND IGNITION SYSTEMS ARE KNOWN EVERYWHERE AS STANDARDS FOR ELECTRICAL EFFICIENCY
THE NAME DELCO ON ANY PIECE OF ELECTRICAL APPARATUS ASSURES YOU OF PERFECT SERVICE ALL THE TIME AND OF FULL EFFICIENCY DURING THE LIFE OF YOUR CAR
THE DAYTON ENGINEERING LABORATORIES COMPANY
DAYTON OHIO

THE PATH OF THE LOCOMOTIVE AND THE PATH OF THE TIRE



Consider this:—The locomotive runs on a path that is smoother than a billiard table. Its tires are made of steel.

The automobile runs on a path that varies from the smoothness of the boulevard to the stone-strewn roughness of the back-country road in the hills. Its tires are resilient rubber.

As a matter of fact, the modern automobile tire is a marvel and its efficiency and economy in the face of the task it has are remarkable.

With the improvements found in WALPOLE TIRES — the extra-tough tread and extra-heavy side-walls scientifically designed to protect against stone-bruise—still greater efficiency and reduction of tire cost are attained.

Walpole "NO STONE BRUISE" Tires

reduce your tire cost per mile through longer service. This is a plain statement of fact that can be easily proven. Let us give you the proof.

Walpole Tire & Rubber Co., General Offices 757 Boylston Street, Boston, Mass.

Factories at Walpole and Foxboro, Mass., and Granby, Can.

VOL. XXVIII NEW YORK—THURSDAY, APRIL 17, 1913—CHICAGO No. 16

The AUTOMOBILE

Detecting Resistance—Saving Fuel

Accelerometer, a New Instrument, Tells What the Motor Is Doing, Indicates Effort Required to Propel Car at Any Speed and Shows the Exact Condition of the Car's Running Gear

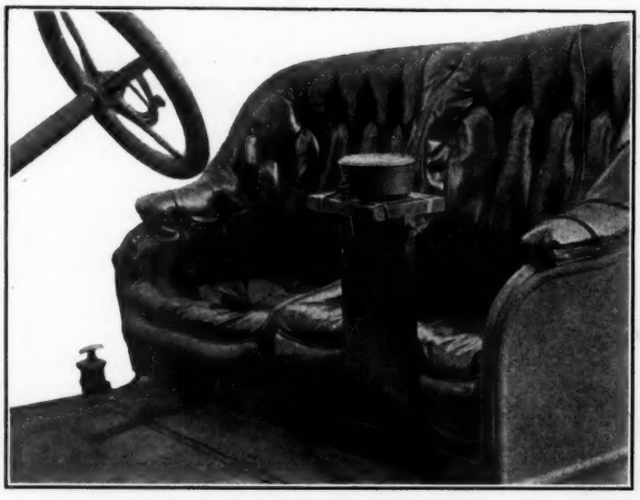
By W. C. Marshall

¶ Hundreds of dollars in tires, gasoline and repairs can be literally thrown away by asking the car to overcome unnecessary resistance. It is impossible for the automobile owner to have his motor taken down and tested on the block every little while to see if he is maintaining it at the efficiency it should be. With the accelerometer he is able to get a complete check on the motor and running gear of the car. No flexible shafting or other connection is required. It is merely clamped to a flat surface on the car. The floor will do well enough or a little shelf may be placed on the dash to support the instrument. A small bracket will readily suffice.

A STEADY effort of 119 pounds is required to drive an average 2-ton automobile along a dry level macadam road at 30 miles an hour. The average touring car weighs very close to 2 tons, therefore if you have a car of this class and it is necessary for your motor to exert a greater effort than this, there is something wrong with your running gear.

A natural question is, "How am I going to know that my car requires too great an effort to propel it?" The answer to this is a mere glance at the dial of the accelerometer, an instrument to be described in this article.

The first idea which would naturally occur to a person would be that an instrument of this kind must be something in the nature of a speedometer, but it is not. It has absolutely no connection to the car in any way except that it is within it or on it. It is just as free of flexible shafting of electric wires as the watch which you have in your pocket. Yet it tells the story of the condition of your car much more completely than the speedometer on the dash or the report of the manufacturer, because the first tells nothing of the effort required to drive the car at any speed and the second offers no proof as to the condition of the chassis after it has been in your hands 10 minutes.

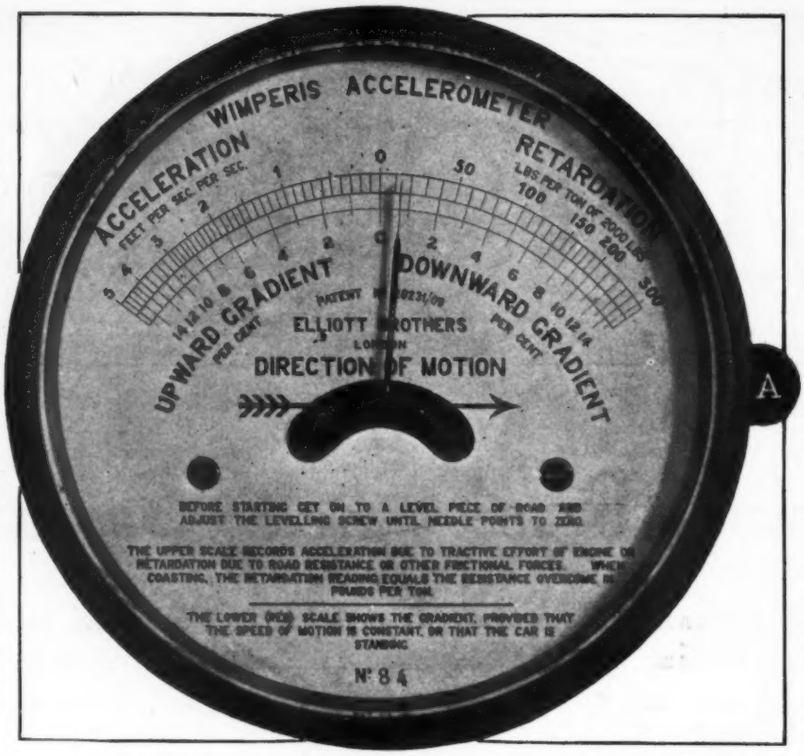


The accelerometer as it appears mounted on a small built-up platform support. The readings can be readily taken as the dial is near the eyes of the operator and can be seen clearly. Note that the instrument is free from any connection to the car other than being carried in a flat place. It is held to the platform in this installation by means of straps. The accelerometer enables the driver to know how many horsepower are needed to drive his car over any road surface at any time. Cars differ amazingly in the amount of power needed for propelling them, and tests have shown that with two cars of approximately the same weight, 20 horsepower more is needed to propel one than the other at 40 m. p. h.

In appearance and in size the accelerometer is very similar to the average alarm clock. The dial is shown on page 834. When carried on the car it can be very conveniently arranged on a Z-shaped support; the bottom arm of which rests on the seat of the car and the

upper arm of which carries the instrument. This means of carrying the device is illustrated on page 833.

The accelerometer tells the car owner the total resistance offered to the progress of the car at any time. Once set it is independent of grades, curves or rough roads. Since the resistance offered by the car is at any time equal to the power exerted by the motor when traveling at a uniform rate of speed the accelerometer gives a full statement of the power exerted by the motor. It would, therefore, be possible to plot a full set of brake-horsepower curves by utilizing the readings on the accelerometer at different motor speeds. All that would be necessary would be to have a table showing how fast the motor was revolving at any car speed. The combined readings of the speedometer and the accelerometer would furnish sufficient data for a complete set of curves.


WIMPERIS ACCELEROMETER
ACCELERATION
FEET PER SEC. PER SEC.
RETARDATION
LBS PER TON OF 2000 LBS
UPWARD GRADIENT
PER CENT
DOWNWARD GRADIENT
PER CENT
ELLIOTT BROTHERS
LONDON
DIRECTION OF MOTION
A
BEFORE STARTING GET ON TO A LEVEL PIECE OF ROAD AND ADJUST THE LEVELLING SCREW UNTIL NEEDLE POINTS TO ZERO.
THE UPPER SCALE RECORDS ACCELERATION DUE TO TRACTIVE EFFORT OF ENGINE OR RETARDATION DUE TO ROAD RESISTANCE OR OTHER FRICTIONAL FORCES. WHEN COASTING, THE RETARDATION READING EQUALS THE RESISTANCE OVERCOME IN POUNDS PER TON.
THE LOWER (RED) SCALE SHOWS THE GRADIENT, PROVIDED THAT THE SPEED OF MOTION IS CONSTANT, OR THAT THE CAR IS STANDING.
No 84

The dial of the accelerometer and directions for its use and adjustment as printed thereon

The total resistance interposed to the progress of a motor-driven vehicle consists mainly of two factors: A fixed quantity due to the rolling resistance and a variable quantity due to air resistance.

The fixed quantity alone gives the resistance to traction and on the average amounts to about 31 pounds per ton for pneumatic tires. For solid tires the resistance amounts to about 26.4 pounds per ton and for non-skid tires about 40 pounds per ton.

Besides the rolling resistance and the wind resistance there are three other factors which enter into the total resistance. These are, the friction in the vehicle itself, grades and curves. If we propel a vehicle at a certain speed over a level road and suddenly stop the propelling force the speed will decrease with a retardation proportional to the total resistance. If the latter is small the retardation will be small and the time required to change the speed will be longer than if the resistances were large as they would be, for example, if the brakes were applied or a strong head wind were blowing.

Again considering the car weighing 2 tons traveling at the rate of 30 miles an hour against a steady resistance of 119 pounds we find this resistance on analysis to be composed of $47 \times 2 + 25 = 119$ pounds. The rolling resistance is 47 pounds to the ton. For 2 tons it will be 47×2 and the wind resistance against the exposed surface of the car at 30 miles an hour, considering 12 square feet exposed, is 25 pounds.

With the accelerometer even this small calculation which is based on empirical formulae, would not have to be made. The indicator on the dial immediately shows the total resistance per ton of the car. It is only necessary to multiply the weight of the car by the reading on the dial to secure the total retarding force. In this way an accurate check may be made at any time on the condition of the brakes or of the motor.

A study of the dial of the instrument will show that it reads in two directions from the zero mark. On one side of 0 is acceleration and on the other side retardation. When measuring the pick-up of the motor, the needle is first set to zero with the leveling screws A when the car is on a level piece of road. The motor is started and the readings taken directly from the dial when speeding up. It will be noted that acceleration is read in feet per second per second. After any required speed has been attained and it is desired to determine the resistance to progress, the clutch is thrown out and the car allowed to coast. The retarding force will then be read on the retardation side of the dial directly in pounds per ton. The weight of the car in tons and fraction of a ton multiplied by the reading on the retardation scale will give the total resistance to progress. It must be noted that the ton is considered as 2,000 pounds in all of these calculations.

The practical value of the instrument is readily explained. Suppose in the car of 2 tons which we have considered, the resistance instead of being 119 pounds, the normal amount should suddenly show to be 200 pounds. The owner of the car would immediately realize that something was wrong. He would be using 60 per cent. more power than he required before. In other words, for every dollar's worth of gasoline he purchased he would be throwing about 40 cents away in overcoming useless resistance.

Dragging brakes, bearings which are too tight, badly aligned wheels and other faults which go to increase the power necessary to pull the car over the road can increase the cost of automobiling enormously. A light-running car is an economy.

When the operator sees by the accelerometer that the resistance has increased to a noticeable extent he goes over his car and perhaps checks a large amount of damage before it occurs. The instance of badly aligned front wheels may be taken to illustrate. The wear on the tires of the front wheels when they are out of alignment is so great that a new pair of shoes may be worn through in about 500 miles of travel. If this misalignment occurred on a car equipped with an accelerometer it would be detected immediately.

Formerly the measurement of road resistance has been determined by observing the pull on a tow line while the experimental vehicle was being pulled by another car along the road. Another method has been by reading the amount of current used in the motors of an electric vehicle at different speeds on roads of varying surfaces.

The accelerometer, as designed by H. E. Wimperis, an Englishman, measures the road resistance when merely attached to the floor, seat or dash of the car.

The instrument is small, being 4 inches in diameter, 2.25 inches high and of cylindrical form. The general appearance of the accelerometer is shown on page 835. There are three legs to support it on a flat surface, one of them which is shown at A being a leveling screw to level the instrument when the vehicle to be tested stands on a level surface. B is a milled

screw used to lock the needle when the instrument is not being used for readings.

The needle is made to stand at 0, when the car is level, by turning the milled-head screw A. The needle swings in a horizontal plane and is not affected by other forces than those acting in the direction of the arrow. When the car is standing on a level, or moving at constant speed on a level, the needle remains at 0. If there is a change in speed, either increasing or decreasing, the needle swings respectively backwards or forwards and this enables the acceleration or retardation to be read on the scale under the needle.

The retardation is read directly in pounds per ton of 2,000 pounds. This is read when the car is coasting, and makes it possible to calculate the resistance of the car by the simple multiplication of the reading by the weight of the car and passengers taken in tons.

This resistance includes road resistances, air resistance and the resistance of the internal mechanism of the car.

If the speed of the car is known in miles per hour the product of speed multiplied by weight in tons multiplied by retardation in pounds divided by the constant 375 will give the horsepower to drive the car at that speed, neglecting tire losses.

This is obvious from the fact that the power lost is equal to the power furnished to drive the car.

As a car will decrease in speed more slowly on a slight down grade, or on a level, than on a rising slope, it will be found preferable to take readings on the former in order to give greater accuracy.

If the instrument is tilted in the direction of motion the needle will move through an angle corresponding to the angle of tilt, and this angle can be read from the graduations at the bottom of the scale. The instrument thus becomes a gradometer and has the power of enabling a slope to be determined while the car is in motion just as well as when standing, provided the speed of the car is uniform.

Although the instrument is sensitive to slopes, it is a fact that the coasting resistance readings do not need correction on account of being made when the car is running either up or down hill. The explanation is, moreover, quite simple. When a car is coasting down hill the slope tends to throw the needle forward while the acceleration, due to the slope throws it in the opposite direction, by just an equivalent amount, so that these two effects neutralize each other. If there were no road resistances the needle would stand at 0. The frictional resistances, due to the motion is practically causing the needle to move away from 0. The needle therefore shows the amount of this resistance, no matter whether the car is on a sloping road or not.

As mentioned, it is better to take readings on a slight downward slope of from 1 in 60 to 1 in 30.

In addition to the longer time thus given for taking the readings, the complicating effect of the change in the momentum, stored in the rotating parts, becomes insignificantly small.

If the rotational momentum is X per cent. of the translational momentum the true road resistance is X per cent. higher than that deduced from the retardation induced by that resistance. This is shown on the dial of the accelerometer when running on a level road.

When the road is not level the instrument reading shows the acceleration or the retardation due directly to the engine, the brakes, the road resistance or to a combination of them, and a knowledge of the slope is unnecessary.

The acceleration scale is useful in measuring the power exerted in accelerating the motor, either from rest or from one speed to another.

The retarding or coasting resistance of the car is first measured at any particular speed. This road resistance in pounds per ton is then added to the acceleration reading at that speed and multiplied by 62.5.

In cases where rubber tires are used the coasting resistance must be increased to find the actual power exerted by the motor at the rim of the driving wheels, on account of the loss in power in the tires.

This amounts to from 20 per cent. to 25 per cent. of the power at the rims. If the front wheels are also included the total tire loss will be approximately 27 per cent. with pneumatic tires, according to Dr. A. Reidler's recent experiments.

Suppose, for example, the coasting resistance of an automobile fitted with pneumatic tires showed 50 pounds per ton reading on the accelerometer. The weight of the car was 2 tons and the speed was 20 miles per hour. If the tire loss were 27 per cent. of the real resistance then the corrected reading would be

$$\frac{50}{.73} = 68.5 \text{ pounds per ton.}$$

If this car were running at 20 miles per hour and the acceleration produced by opening the throttle wide was 1.75 feet per second per second then the tractive effort produced would be $1.75 \times 62.5 + 68.5 = 177$ pounds per ton.

(The constant 62.5 is obtained by dividing the number of pounds in a ton by the gravitational constant in feet per second per second.)

This also gives a means for comparing the power of different car engines, or comparing the effect on accelerating power by change of carbureter nozzle diameters, or change of air-inlet opening in the carbureter.

Successive trials of various nozzles with varying air inlets for each nozzle eventually determine which combination is most effective in producing the greatest acceleration from 20 miles per hour or from any other assumed speed.

In the example above the power necessary to accelerate the car 1.75 feet per second per second from 20 miles per hour would increase the speed to 28 miles per hour 10 seconds.

At this rate the horsepower at the rear-wheel rim would be about 21, which indicates a motor power of approximately 28.

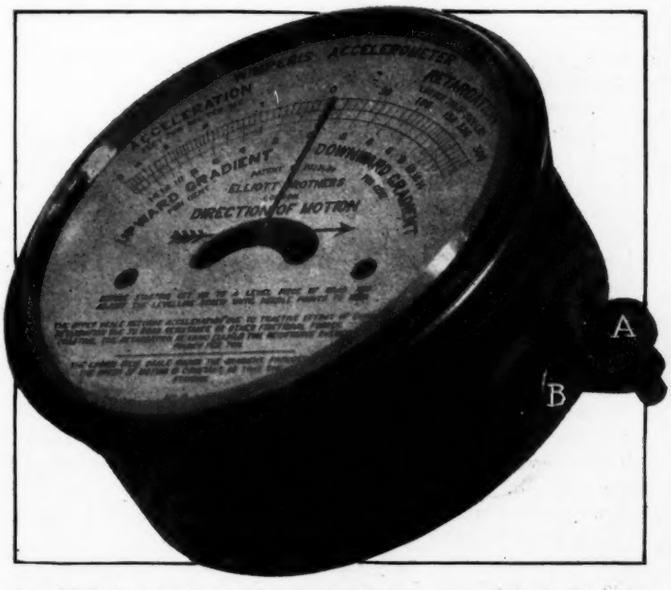
It might be that a car was ascending a gradient during the test but, as explained above, this in no way affects the calculation.

This power of acceleration would be equivalent to the power necessary to drive the car at 20 miles per hour up a hill the gradient of which was 1 to 18.4 or a 5.4 per cent. grade.

In making tests on the road the influence of the various internal mechanisms of the car on its speed may be studied by running at different speeds with the various gears in mesh.

The engine friction can be approximately determined by running at a certain speed, then cutting off ignition and coasting.

(To be continued.)



Partial side view of instrument, showing needle lock B and leveling screw A

Goux Makes 106.2 Miles in 60 Minutes

Breaks 50 and 100-Mile Records and Establishes New 1-Hour Figure in 30-Horsepower Peugeot

¶ LONDON, ENG., *April 12.—Special Cable.—At Brooklands today Jules Goux on a 30-horsepower Peugeot shattered Lambert's existing 1-hour record of Feb. 15 on the same track by covering 106.2 miles within the 60 minutes. The world's records made by this latest speed performance are 50 miles in 28 minutes 18.65 seconds at a speed of 105.97 miles per hour; 100 miles in 56 minutes 29.93 seconds at a speed of 106.2; and 150 miles in 1 hour 28 minutes 35.67 seconds at an average speed of 105.9 miles per hour. The motor dimensions are 110 millimeters bore by 200 millimeters stroke, cubic capacity, 7,603 cubic centimeters. The weight of the machine is 3,220 pounds.*

THE terrific average speed of 106.2 miles an hour maintained for the entire period of an hour is scarcely believable in so small a vehicle as the automobile. The finest trains of America maintain a much lower average than this when traveling over their specially constructed highway of steel. The Twentieth Century Limited, making the trip between New York and Chicago in 20 hours, averages only 45.6 miles an hour. It would be interesting to note where this train would be as compared to the racing car driven by Goux, could they travel over parallel routes between New York and Chicago at the respective relative speeds of 106.2 and 45.6 miles an hour. A table showing this comparison follows:

City	Elapsed Hours	Distance in Miles from New York	Miles Covered by Train	Miles Covered by Racing Car
New York	0	0	0	0
Albany	3	142	142	319
Buffalo	8.9	411	411	947
Cleveland	12.6	575	575	1340
Toledo	15.1	688	688	1608
Chicago	20	912	912	2123

By the time the train reaches Buffalo the racing car will have been in Chicago for several minutes. When the Twentieth Century had reached Chicago the racing car would have been two-thirds the way across the continent of America.

The idea of speed is relative. We compare the speed of a certain vehicle with that to which we are accustomed in our daily travel and which is compatible with safety according to modern methods of construction. On the ocean, we say a vessel is fast that can make the transatlantic trip under 5 days. Let us consider the record of the Mauretania, made in 1910. This vessel made the trip from Queenstown to New York in 4 days 10 hours and 41 minutes. The distance between these two ports is 2,820 nautical miles. Reducing the average speed of the vessel to land miles for the sake of comparison we find that the Mauretania averaged 29.7 miles an hour on her record-breaking trip across the ocean. If Goux had a good track to travel across the ocean and made the same average speed that he made in his record-breaking race against time, it would take him 30 hours to make the trip. Just 6 hours over a day!

The automobile is the fastest vehicle which man has yet found to satisfy his craving for speed. The flights of fancy of a Jules Verne or Baron Munchausen are surpassed daily, even on the streets of the larger cities. Ultimate speed has always been of intense interest to the human mind. The runners at the Olympic games always provoked the greatest interest. The chariot races, horse races, aeroplanes and automobile races have been and are the means of drawing a thrill-loving audience. The history of speed has interwoven itself so closely with the history of nations that it almost may be said to measure civilization.

The accompanying chart gives the records made with some of the fastest methods of transportation in the hands of man.

Goux, in establishing his record for the distance covered in an hour also established new 50-mile and 100-mile records. It is interesting to note that his speed was greater during the second 50 miles than during the first 50 miles. At the end of the first 50 miles he had averaged 105.97 miles an hour. The second 50 miles was made at a sufficient rate of speed to bring his average up to 106.2 miles an hour. In other words, for the second 50 miles the average was 106.43 miles an hour.

LONDON, ENG., April 1.—Following up his successful driving, which appealed so strongly to those who attended the Easter motor-car racing meeting at Brooklands, Jules Goux has been busy attempting records on his 30-horsepower Peugeot in which he won the French Grand Prix on the Sarthe circuit last year. He succeeded in bettering on all the figures in the 40-horsepower class from the flying .5-mile to the ten laps of the track, which is equal to about 27.5 miles. For the flying .5 mile he occupied 16.38 seconds, which is equal to a speed of approximately 110 miles an hour. The flying kilometer was covered in 20.79 seconds, which is equal to 107.5 miles an hour and the flying mile was returned at 33.87 seconds, which is equal to 106.5 miles per hour. The car was then brought to a halt and from the standing start the car covered ten laps of the track, which is equal to 27.5 miles, in 16 min. 4.9 secs., which is equivalent to 102.5 miles per hour.

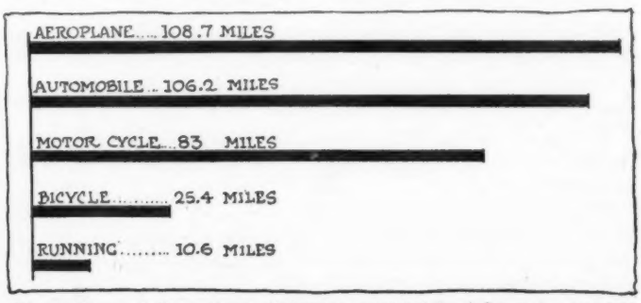
A day later Goux was again in action with the 30-horsepower Peugeot and it was decided that the 6 hours' record should be attempted and a start was to have been made at 9 a. m., but, owing to rain, it was delayed. It is interesting to note that in this attempt, despite the stoppages for tire trouble, for the second time in the history of racing, 100 miles was covered within the hour. He covered that distance in 59 minutes 49.78 seconds.

This 30-horsepower Peugeot is not one of the cars that will compete in the 500-mile race at Indianapolis on May 30, but those that will compete are now undergoing alterations at the French factory and will not be on the roads for 1 week or 2 yet. They are identical to the Peugeot that has been running in England at Brooklands in every respect with the single exception of cylinder capacity. The 30-horsepower Peugeot at Brooklands at the time of writing, has a bore of 110 millimeters and a stroke of 200 millimeters, whereas the racers for the Indianapolis Speedway will have new cylinders cast, measuring a bore of 108 millimeters in order to comply with the regulations laid down for all entrants for this great event.

Sixteen Entered for Decoration Day

INDIANAPOLIS, IND., April 14—Among the sixteen cars entered so far for the Memorial Day race are the following makes: Stutz, Nyberg, Keeton, Mason, Henderson, Smada, Peugeot, Sunbeam.

NEW YORK CITY, April 15—The N. A. A. M. has published a statement explaining that at present there are no plans on hand for the use of a special automobile exhibition building in the 1915 show at San Francisco. The N. A. A. M. some time ago started an inquiry among the automobile makers whether they were sufficiently interested in the Panama show, with negative result, whereupon plans for a special building were dropped.



Comparison of the record distances covered in 1 hour by various means of locomotion

Bill To Tax Trucks $5 a Ton in Bay State

Automobile Interests are Preparing to Fight—Are Now Resolved To Kill All Legislation on Trucks

BOSTON, MASS., April 12—The Committee on Roads and Bridges of the Legislature reported today a motor truck bill calling for a tax of $5 per ton for each ton capacity of commercial vehicles. The motor interests were very much surprised at this for, by agreement in conference between the representatives of the motorists and the Highway Commission, a bill was drawn calling for $5 for the first ton and $2.50 for each additional ton. A meeting has been called by the motor interests for Monday morning to take action on the matter, and the plans of the motorists are now to try to defeat all motor bills on trucks before the Legislature, leaving the law as it is. Interesting developments are looked for as the result of this seemingly uncalled for report after the conferences and compromises that had apparently straightened out things. It will be the best thing all around, however, if all the proposed legislation is defeated.

Lien Law Passed in Indiana

INDIANAPOLIS, IND., April 14—The Indiana Legislature, which recently concluded its biennial session, passed a lien law for motor car interests. This was not generally known, as it passed through both houses without debate.

Within 1 year from the refusal or failure of the owner of any motor car, including trucks, to pay any storage, repair or supply bill, a complaint may be filed to foreclose a lien in the Circuit Court where the car or truck is located. The law allows a lien for storage charges, supplies furnished or repairs done in favor of every person, firm or corporation or others maintaining automobile garages or engaged in storing or furnishing supplies or repairing.

Another important law passed is that aimed at joy-riders. It makes it unlawful "for any person to take possession or to assume control of any vehicles of any character whatsoever, which vehicle is the property of another, and to use, drive, run or operate such vehicle without first procuring the consent of the owner, or to ride with or accompany a person who is so doing, knowing that it is being done without the knowledge and consent of the owner."

For violations the penalty is a fine of from $25 to $500 to which the court, at its discretion, may add imprisonment or from 10 days to 6 months.

Hartford Sues Concrete Bumper

NEW YORK CITY, April 15—Rollie B. Fageol, the inventor of the concrete steel bumper, and the Hartford Suspension Co., Jersey City, N. J., have sued the Concrete Bumper Co. (Ed. R. C. Struthers), New York City, charging infringement of the Fageol patents. The complaint has been filed this week and will come up in the United States District Court, Southern District of New York, on April 18. The complainants are praying for a preliminary injunction to prevent the defendant from manufacturing and selling concrete-filled bumpers or to have him file a bond with the court.

Cut Boston Owners' Insurance Rates

BOSTON, MASS., April 10—Insurance companies in Boston and vicinity that handle automobile insurance announced today that a reduction had been made both on pleasure cars and motor trucks. On the cars used for pleasure a reduction of $2.50 for each automobile will be made, regardless of its horsepower, provided the employers' liability hazard is eliminated. In other words, the reduction affects principally the man who operates his own car. To secure this reduction the following indorsement must be attached to policies: "It is understood and agreed that the policy to which this indorsement is attached does not cover accidents occurring to employes of the assured while engaged in operating or caring for automobiles covered hereby."

Special attention is called to the fact that this reduction applies only to the rate for liability insurance for private pleasure automobiles. No change is authorized for property damage or collision insurance. The reduction in the premiums on commercial cars is more sweeping. Such cars are rated in classes according to the nature of the business their owners are engaged in, and shows the trend of recognizing the growing importance of the truck business. On class 4 the premium rate for liability insurance is reduced from $60 to $45, and for property damage from $24 to $18; on class 5 the liability rate is reduced from $45 to $35, and for property damage from $18 to $14. Class 4 includes all machines used by barrel and box makers, contractors and manufacturers of building materials, carpenters, cleaners and dyers, coal merchants, hay, grain and feed dealers, furniture dealers, gas and water concerns, ice dealers, laundry men, lumber dealers and piano manufacturers. Class 5 comprises all makes of commercial vehicles not otherwise classified.

Batavia Campaign Looks Hopeful

NEW YORK CITY, April 15—According to Holmes, Rogers & Carpenter, attorneys for the Batavia Rubber Co., Batavia, N. Y., the matter of this company's campaign against alleged imitators of its non-skid tread is progressing well. The United & Globe Mfg. Co., Trenton, N. J., has decided to change the design of its tread so as to prevent a possible confusion on part of buyers with Batavia tread. The same holds good of the Stoddard Rubber Tire Works, Worcester, Mass. Several other important companies also in negotiation with the Batavia concern are almost ready to make a similar agreement.

The attorneys of the Batavia company have succeeded in convincing the court that the motion of the Seamless Rubber Co., New Haven, Conn., in the suit of the Batavia Rubber Co. against it, to dismiss the suit was not justified, and Judge Noyes of the United States District Court, Southern District of New York, decided against the Seamless company. The attorneys of the complainant showed to the satisfaction of the court that while Seamless tires were sold in New York under another company's name, payments were made to the New Haven concern.

NEW YORK CITY, April 14—Justice Henry G. Ward, of the United States District Court, Southern District of New York, last week ruled that the Automobile Tire Co., of this city, file a bill of information in the suit pending against it on complaint of the Fisk Rubber Co., Chicopee Falls, Mass. The suit, which is for payment of three notes, amounting respectively to $3,000, $3,000, $3,272.95, or a total amount claimed of $9,305.45 and interest since July 3, 1911, has been brought by the Fisk company through its attorney, Sydney S. Meyers.

Sparton Users Reply to Klaxon

NEW YORK CITY, April 15—The Jackson Eastern Distributors, the Haynes Automobile Co. and the Garland Automobile Co., New York City representatives of Jackson, Haynes and Velie manufacturers, respectively, have filed their answers to the complaints of the Lovell-McConnell Mfg. Co. in the United States District Court, Southern District of New York. In their reply they claim that the Klaxon patents Nos. 923,048, 923,049 and 923,122 were anticipated by earlier patents granted to Woolstock & Ostrander, Edison, Stromberg, Gray and others. The defendants ask the court to dismiss the complaint on the grounds that even if the Klaxon patents are, as is claimed by the Lovell-McConnell company, capable of conjunctive use, the plaintiffs have not stated in their complaint that conjunctive application of the patents has been made in the case of the Klaxon horn.

Gotham Speed Limit Is 25 Miles

NEW YORK CITY, April 16.—The Board of Aldermen of the City of New York yesterday passed an ordinance regulating the operating speed of automobiles. Speed limits of 15, 20 and 25 miles an hour were established for sections of varied density of population. The ordinance also provides for slowing down to 4 miles when turning a corner or crossing a street or highway and prohibits passing a street car within less than 8 feet while the car is standing for the purpose of taking on or letting off passengers. In passing a public school on a school day or a bridge, 10 miles an hour is the limit. Federal and municipal vehicles are exempt from all the foregoing regulations when on duty.

The penalty for a first offense is from $25 to $100 fine, 15 days in jail or both; for second offense committed within 1 year after the first, from $50 to $100, imprisonment up to 30 days or both; for a third or subsequent offense, within 1 year from the first, $100 fine, 60 days in prison or both.

The ordinance which repeals all city ordinances contrary to it, will go into effect on June 1, 1913. It is practically an amendment to the Callan law which is very vague in the points covered by the ordinance and leaves many of them to the discretion of the judge.

Big February Exports

Canada Bought Cars for $1,086,560—International Motors' New Officers

WASHINGTON, D. C., April 15—*Special Telegram*—Canada leads in the importation of American automobiles for February among foreign countries, with 916 machines, representing $1,086,560. The United Kingdom is second with 431 machines, representing $359,779. South America is third with 283 machines, representing $304,630. By comparison with February, 1912, big increases are shown in exports to different countries in each instance.

The monthly summary of commerce issued by the National Bureau of Statistics continues to show a falling off in the value of imports and an increase in the value of exports for the automobile and allied industries. The report herewith on automobile parts, rubber and gasoline shows the figures as compiled for the month of February, 1912, and February, 1913:

Imports

	Feb., 1912	Feb., 1913.
Automobile parts (not tires)	$29,241	$17,483
Unmanufactured rubber	10,726,975	9,026,124

Exports

Automobile parts (not tires)	345,965	444,728
Rubber tires	267,036	276,253
Total rubber, all kinds	1,042,630	1,103,742
Gasoline	560,684	636,578

WASHINGTON, D. C., April 14—The Department of Commerce at Washington has compiled a report showing the comparative value of automobiles exported from the United States, England and France during the past few years. It will be noticed that the export business of the United States has jumped more than $10,000,000 during the past year. The figures from England and France are not as yet available for the past year, but no startling change will be seen when they are published. The comparative table follows:

	Year Ended Dec. 31		
Year	United Kingdom	France	*U. S.
1897	.....	$121,000	.....
1898	.....	340,000	.....
1899	.....	832,000	.....
1900	.....	1,834,000	.....
1901	.....	3,070,000	.....
1902	$837,000	5,883,000	$950,000
1903	1,674,000	9,898,000	1,207,000
1904	1,747,000	13,825,000	1,895,000
1905	2,637,000	19,568,000	2,481,000
1906	4,228,000	26,833,000	3,497,000
1907	6,725,000	28,098,000	5,501,000
1908	6,423,000	24,779,000	5,278,000
1909	8,141,000	28,541,000	5,992,000
1910	13,460,000	31,510,000	11,190,000
1911	17,246,000	30,795,000	15,509,000
1912	.....	.....	25,657,000

*Year ended June 30.

Consolidated Lubricants Now Wagner

NEW YORK CITY, April 14—The Consolidated Lubricants Co., maker of Wagner lubricants for automobiles, has changed its name to the Wagner Oil Co. The officers and capitalization of the company remain the same. Fred J. Wagner is president, I. M. Uppercu vice-president and J. C. Nichols treasurer, the capital remaining at $25,000.

A. A. A. Negotiates with W. A. A.

NEW YORK CITY, April 16—Matters are not entirely settled between the American Automobile Association and the Western Automobile Association, the new California body organized to control motor contests in the West. Chairman Schimpf of the Contest Board went West some weeks ago to settle the situation and agreed with the Automobile Club of southern California, through a committee of seven, to administer contest affairs in that territory under the jurisdiction of a contest board. Edward G. Kuster, of the club, was appointed member of the contest board to work with a committee of seven to be selected by the California club. At this point in the proceedings the Western association demanded that the club allow them to name the seven members of the committee, which was refused. Further, the club of southern California has refused to recognize the Western association and continues its membership in the A. A. A. It would appear that what the Western association originally asked for has been granted, but no sooner was such given than a new issue has been taken up by them. The committee of seven is to be made up of four from Los Angeles, one from San Diego, and two from other sections of the territory. It would appear now that if the Western organization does not agree, that its action is simply taken to delay settlement.

S. A. E. to Study Steel's Properties

NEW YORK CITY, April 16—At a meeting of the Iron and Steel Division of the Standards Committee of the Society of Automobile Engineers held at the headquarters of the society here it was decided to delve further into the physical properties of the steels. The manufacturer cannot get satisfaction from an entirely chemical specification and requires definite data on the physical properties. At the same time the steel manufacturer can work better from a chemical analysis. It was decided to amplify the results of the committee's investigation as reported at the January meeting of last year with further reports on the elastic limits and other physical properties to be expected of steels of different chemical constituents. The next meeting of the sub-committee of fuels will be held at the headquarters of the society on April 24.

NEW YORK CITY, April 14.—The vice-presidency of the International Motor Co., vacant heretofore, has been filled by John Calder, with L. H. French and E. C. Fink, first, second and third vice-presidents respectively. Mr. Calder was connected as factory manager with the Cadillac Motor Car Co., while the other two officials were members of the International organization before. R. E. Fulton, formerly assistant sales agent, has been made general sales agent, and George H. Hodges, formerly traffic engineer, is now assistant general agent. J. N. Van Harlingen is manager of the company's transportation-cost department.

Automobile Securities Quotations

The general trend in the stock market this week was down, and as a consequence all automobile securities except Pope Mfg. and Maxwell first preferred either dropped or remained unchanged. Renewed weakness in tire securities seemed to indicate chariness of the public toward the assurances that the industry was again in normal condition.

	1912 Bid	1912 Asked	1912 Bid	1912 Asked
Ajax-Grieb Rubber Co., com	..	..	150	165
Ajax-Grieb Rubber Co., pfd	..	..	93	99
Aluminum Castings, pfd	..	..	98	100
American Locomotive Co., com	42	42½	36	37
American Locomotive Co., pfd	110	110½	103¼	104
Chalmers Motor Company, com	..	..	125	132
Chalmers Motor Company, pfd	..	..	98	102
Consolidated Rubber Tire Co., com	11	20	17	21
Consolidated Rubber Tire Co., pfd	20	40	60	75
Firestone Tire & Rubber Co., com	234	240	265	270
Firestone Tire & Rubber Co., pfd	108	110	104½	106
Fisk Rubber Co., com	..	..	..	..
Fisk Rubber Co., pfd	..	..	..	102
Garford Company, preferred	..	..	99	101
General Motors Company, com	36	37	30½	33
General Motors Company, pfd	80½	81½	75	76
B. F. Goodrich Company, com	..	..	34	35
B. F. Goodrich Company, pfd	..	..	95	96
Goodyear Tire & Rubber Co., com	396	400	300	..
Goodyear Tire & Rubber Co., pfd	108	110	100	102
Hayes Manufacturing Co	..	..	..	90
International Motor Co., com	..	..	5	10
International Motor Co., pfd	..	..	25	40
Lozier Motor Company	..	..	..	20
Maxwell Motor Co., com	..	..	5	10
Maxwell Motor Co., 1st pfd	..	..	55	70
Maxwell Motor Co., 2nd pfd	..	..	20	30
Miller Rubber Company	..	..	160	170
Packard Motor Company	104	107	98	103
Peerless Motor Company, com	..	..	35	45
Peerless Motor Company, pfd	..	..	95	100
Pope Manufacturing Co., com	37	40	19	22
Pope Manufacturing Co., pfd	78	80	60	65
Reo Motor Truck Company	8	10	11½	12½
Reo Motor Car Company	23	25	21	22
Rubber Goods Mfg. Co., pfd	100	105	100	105
Studebaker Company, com	..	..	29½	31
Studebaker Company, pfd	..	..	90	93
Swinehart Tire Company	..	..	87	91
U. S. Rubber Co., com	57	57	66	66½
U. S. Rubber Co., 1st pfd	115	115½	108	108¾
White Company, preferred	..	..	107½	109
Willys-Overland Co., com	..	..	63	68
Willys-Overland Co., pfd	..	..	90	98
Portage Rubber Co., com	..	..	38	42
Portage Rubber Co., pfd	..	..	90	94

Miller To Double Stock

Plan To Increase Capital to $2,000,000 —Maxwell Capital Now $37,000,000

AKRON, O., April 15—*Special Telegram*—The Miller Rubber Co., of this city, at its last directors' meeting decided to submit a plan to the company's stockholders, by which the capital stock of the company be increased from $1,000,000 to $2,000,000. The increase is to be half common and half preferred stock, 5,000 shares of each to be issued at $100 a share. A meeting of the stockholders will be called at an early date to decide on the question of this issue. The company means to offer one-fourth, or $250,000 of the new issue, for sale, the present stockholders to be given an opportunity to buy to the extent of 25 per cent. of their present holdings, while the rest of the $250,000 worth of stock is to be disposed of in the open market.

—

NEW YORK CITY, April 14—The Willys-Overland Co.'s board of directors on April 11 declared the quarterly dividend of 1 1-2 per cent. on the $20,00,000 of common stock to be paid on May 1. A quarterly dividend of 1 3-4 per cent. was paid on the $5,000,000 preferred stock issued on April 1.

—

Maxwell Sheet Shows $47,000,000

NEW YORK CITY, April 14—The Maxwell Motor Co., Inc., has published its balance sheet, showing its assets and liabilities on January 31. This account shows assets to the amount of $46,753,668.08, of which more than half, namely, $26,849,880.44, is put down as the aggregate value of the company's good will, models, patents, trade marks and trade names. Operating equipment as well as current and working assets amount to approximately $10,000,000 each. On the liability side of the sheet, the capital liabilities, amounting to $37,000,000, take the first place. The current liabilities total only $1,135,592.64. The detailed report follows:

Assets

Capital assets:		
Real estate, buildings, machinery, equipment		$9,026,330.72
Investments—Briscoe Mfg. Co., etc		680,056.36
		$9,706,387.08
Goodwill, models, patents, trade marks, trade names		$26,849,880.44
Current and working assets:		
Inventories	$5,415,339.26	
Account receivable	1,985,355.57	
Note receivable	288,648.08	
Prepayment	77,866.55	
Cash on hand together with $1,552,022.07 from Reorganization Committee	2,430,191.10	
	$10,197,400.56	
Total assets		$46,753,668.08

Liabilities

Capital liabilities:		
Common stock		$13,000,000.00
First preferred		13,000,000.00
Second preferred		11,000,000.00
		$37,000,000.00
Deferred liabilities:		
First mortgages and purchase obligations		$156,342.50
Current liabilities:		
Notes and accounts payable		$756,688.22
Customers' deposits		131,834.75
Receivers' certificates (paid March 24, 1913)		150,000.00
Accrued interest, wages and expenses		88,069.67
		$1,135,592.64
Reserve for depreciation of capital assets:		
Buildings, machinery and equipment		$2,598,760.70
Reserve for depreciation of current and working assets:		
Inventories	$3,594,621.21	
Accounts and notes receivable	1,103,140.43	
	$4,697,761.64	
Reserve for establishment of business expenses:		
Applicable to prior period and other items		$1,165,210.60
Total liabilities		$46,753,668.08

The capitalization of the company given in this balance sheet as $37,000,000 includes an increase of $6,000,000 over the original capitalization of the company, which amounted to $31,000,000. The new issue of $6,000,000 has been incurred in order to pay for property acquired by the former Flanders interests after the original reorganization plan which provided for $31,000,000 stock had been put into practice. By issuing additional stock it is possible to carry out the original plans of the company practically without alteration.

—

MILWAUKEE, WIS., April 12—Intimations have come from many quarters that the Allis-Chalmers Mfg. Co., the reorganization of the defunct Allis-Chalmers Co., of Milwaukee, which will take control of the properties within the next 2 weeks, will devote much of the time of its extensive electrical works to the production of electrical apparatus for motor cars and trucks, notably cranking and self-starting devices. The company's electrical business is almost entirely concentrated, for the purposes of production, in Cincinnati, the seat of the Bullock Electrical Co., one of the Allis-Chalmers group. Here there are being manufactured at the present time a large number of electrical cranking devices for the Mitchell-Lewis Motor Co., of Racine, Wis., in conformity to the specifications of the Mitchell engineers. However, it is intimated that the company will bring out an electrical cranking device of its own design and manufacture, bearing the well-known Allis-Chalmers trade mark and name.

—

COLUMBUS, O., April 12—The Ohio House of Representatives has concurred in the Senate amendments to the Hudson-Hite good roads bill which definitely fixes the system of market roads and inter-county highways to be constructed under the supervision of the Ohio state highway commission. The system of roads is to be built with proceeds from a special tax levy and will amount to approximately $3,350,000 yearly. One-quarter of the fund will be used by the state to construct market roads and the prisoners of the Ohio state penitentiary will be used in that work.

The remainder of the fund is to be used for road construction under the present law and will be apportioned to the eighty-eight counties of the state. An amendment was also made permitting the work to be started earlier in the spring.

A bill has been introduced in the Ohio Senate providing that the receipts of the state automobile department shall be turned into the state treasury without deducting expenses.

—

NEW YORK CITY, April 14—W. P. Kennedy, head of the Transportation Cost Bureau of the American Locomotive Co., resigned last week. No successor will be appointed. This department will be handled by a member of the engineering force.

Market Changes of the Week

Tin held full sway in this week's markets, rising $1.00 per hundred pounds. Starting at $48.50 it rose to $50.00, the highest during the week, then dropped and closed at $49.50. The demand for lead is fairly active with prices calling at $4.35 and $4.40. Both coppers experienced a slight gain of $.00 1-8, closing at $.15 1-2 per pound. There was an absence of new developments in the petroleum markets this week, both Pennsylvania and Kansas remaining firm with unchanged prices. The market for automobile scrap retains a firm tone. The market for foreign scrap remains unchanged. According to importers the demand from consumers holds up well, and stocks abroad are in some cases said to be inadequate for the supply.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, lb.	.07⅝	.07⅝	.07⅝	.07⅝	.07⅝	.07⅝	.....
Beams & Channels, 100 lbs.	1.61	1.61	1.61	1.61	1.61	1.61	.....
Bessemer Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	.....
Copper, Elec., lb.	.15⅜	.15⅜	.15⅜	.15⅜	.15½	.15½	+ .00⅛
Copper, Lake, lb.	.15⅜	.15⅜	.15⅜	.15⅜	.15½	.15½	+ .00⅛
Cottonseed Oil, bbl.	6.80	6.79	6.81	6.83	6.89	6.88	+ .08
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	.....
Fish Oil, Menhaden, Brown	.33	.33	.33	.33	.33	.33	.....
Gasoline, Auto, 200 gals	.22¼	.22¼	.22¼	.22¼	.22¼	.22¼	.....
Lard Oil, prime	.94	.94	.94	.94	.94	.94	.....
Lead, 100 lbs.	4.35	4.35	4.35	4.35	4.35	4.35	.....
Linseed Oil	.47	.47	.47	.47	.47	47	.....
Open-Hearth Steel, ton	29.00	29.00	29.00	29.00	29.00	29.00	.....
Petroleum, bbl., Kansas crude	.88	.88	.88	.88	.88	.88	.....
Petroleum, bbl., Pa., crude	2.50	2.50	2.50	2.50	2.50	2.50	.....
Rapeseed Oil, refined	.68	.68	.68	.68	.68	.68	.....
Silk, raw, Italy	....	4.35	....	....	4.35	4.35	.....
Silk, raw Japan	....	3.70	....	....	3.70	3.75	+ .05
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	48.50	48.60	49.10	49.10	50.00	49.50	+1.00
Tire Scrap	.10	.10	.10	.10	.10	.10	.....

Motor Spirit on Test

Stromberg Finishes a Series of Comparisons with Gasoline

CHICAGO, ILL., April 12—The first complete tests of the new fuel Motor Spirit were completed today when the Stromberg Motor Devices Co. finished a series of exhaustive comparisons of the new distillate and gasoline extending over a period of 3 weeks. Both road tests and laboratory tests in the completely equipped Stromberg testing laboratories were made. The same engines and carbureters were employed with both fuels.

Comparisons of power and economy and response to throttle opening were made at all speeds with each fuel. The results of the tests show practically no difference between the two fuels, either in fuel consumption or power. There was very slight difference also in the picking up of the motor with the two fuels, one being slightly less responsive at some speeds and the other less responsive at other speeds.

What is perhaps the most important feature for those who contemplate trying out the new fuel is that with Stromberg carbureters, at least, no change whatever in the adjustment of the carbureter is necessary. The Stromberg test showed that best results were obtained with the same proportion of air on either motor spirit or gasoline.

Interchangeable With Gasoline

This means that when a motorist's supply of Motor Spirit is exhausted, he can simply fill his fuel tank with gasoline and go ahead without even adjusting the carbureter. This is in contradiction to the results obtained by the Standard Oil Co. of Indiana, which developed the new fuel. This company finds that more air should be given with the Motor Spirit than with gasoline.

Road tests at the Stromberg plant were made on a six-cylinder car weighing 3,700 pounds and showed 15 miles per gallon on both Motor Spirit and gasoline. The fuels used were gasoline of 56 degrees Beaumé and motor spirit of 60 degrees Beaumé gravity.

The official report of the tests follows:

The new fuel, Motor Spirit, was tested in direct comparison with gasoline, first in the laboratory and second on the road. Curves are submitted herewith showing the results of the laboratory tests.

As will be seen, there is practically no difference. However, on the exhaust gas analysis at low speed there is a slightly larger quantity of CO present in the exhaust with the Motor Spirit, but at high speeds combustion is the same as with gasoline. Tests were made for acceleration as well and as far as can be determined the Motor Spirit is slightly "logy" at low speeds, but much snappier above 600 revolutions per minute. On the road the results were about the same. Below 10 miles per hour the car with Motor Spirit was slightly "logy," but at medium and high speeds had about the same snap.

On the fuel consumption test, running with 1 gallon of each fuel over the same course and in the same direction, they both checked the same mileage at 15, 20 and 25-mile rates. This was accomplished with no change whatever in the carbureter, and, in fact, when the carbureter was adjusted for gasoline, could not change the adjustment when using Motor Spirit to make it the least degree better. Starting was accomplished as readily with Motor Spirit as with gasoline in the coldest weather.

With the Motor Spirit there is, however, a faint smoke in the exhaust and the odor is slightly noticeable. The peculiar odor of this fuel would be obnoxious for pleasure driving, as if any is spilled on the car filling the tank the odor remains for several days. Cannot see any reason why this fuel cannot interchange in any car without making any difference whatever in the running conditions. Should say it was desirable for truck work on account of its low price.—EARL A. BESSOM, Engineering Dept., Stromberg Motor Devices Co., Chicago, Ill.

The Fuel Situation in England

BY J. S. CRITCHLEY.

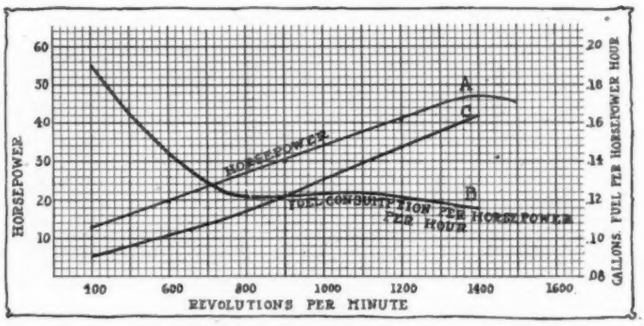
LONDON, ENG., April 1—The fuel question is much more serious in this country than it is in America. The present price of gasoline is 42 cents per gallon and there is every indication that it will go up to 48 cents.

The Society of Motor Manufacturers & Traders, the Royal Automobile Club and the Automobile Assn. have put up together a sum of $5,000 in order to further investigate the question of a gasoline substitute. The three bodies referred to have each appointed three representatives, and it is the intention of this committee to obtain and publish reliable data on the fuel problem.

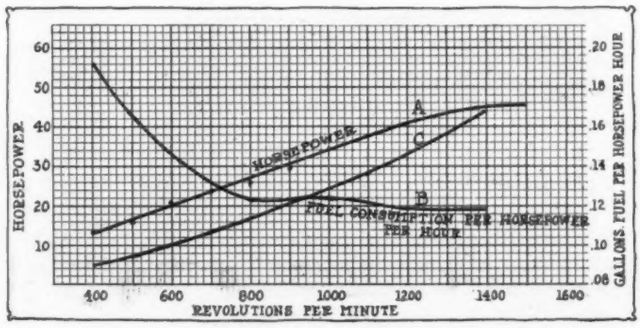
The recent taxicab strike in this city has been entirely due to the increased price of fuel. During the whole of last year the standard price for the gasoline supplied to the cab companies was 15 cents per gallon, which included 3 cents duty. All the contracts ran out on December 31, and the new contracts were fixed by the gasoline distributors at 25 cents per gallon, including the duty. The taxicab drivers were charged by the operating companies cost price, this cost price being agreed to and settled by an award drawn up by an arbitration board appointed by the Board of Trade to settle disputes between the cab owners and the drivers. The award referred to ruled that in the event of any increase in the price of gasoline over 10 per cent. of the then existing price, the increase should be paid by the drivers. In accordance with this award the cab proprietors intimated to the drivers that the future price of gasoline would be raised to the amount of the increased price. The cab drivers then refused to be bound by the award and refused to work the cabs and the whole of the cabs belonging to the Cab Owners Federation were put out of service on January 1 last.

The British Motor Cab Co., which runs about 1,000 cabs and which is composed of members of the Owners Federation, has endeavored to compromise the matter by utilizing a mixture of gasoline and paraffin, the proportion of paraffin being as one to three, and in order to overcome any difficulty in starting, a small gasoline tank was fitted with a direct connection to the induction pipe. This mixture was offered to the drivers at 21 cents per gallon. The drivers refused to accept the fuel at this price whereupon the British Motor Cab Co. offered to supply it at 16 cents per gallon.

This proposition did not meet with the approval of the other members of the federation. Some of them thereupon offered to supply gasoline at the old price of 16 cents per gallon, the result being that the cabs of the federation owners are now again in service and that gasoline is being supplied to drivers at the old price, so that with every gallon of gasoline supplied to the drivers the owners lose 8 cents. As there are some 7,000 cabs



Horsepower and fuel consumption curves on motor spirit



Horsepower and fuel consumption curves on gasoline

in London run by companies, and as each cab consumes approximately 3 gallons of gasoline per day, the cost to the cab owners amounts to no less than $1,750 per day, or $525,000 per annum. As the cab companies at the existing rate of fares have only just been able to make ends meet it would appear that with this loss on the sales of gasoline many cabs will have to be put out of service.

With regard to a mixture of paraffin and gasoline, any idea of now running cabs on this mixture is, of course, at an end, as the drivers would resist using this mixture when some of the larger operating companies are supplying gasoline at 16 cents and if one company did attempt to force this mixture on the market the drivers would immediately strike.

There is nothing new in the employment of a mixture of this description, and a large number of commercial vehicles in this country were already running on a fuel of this description.

The most interesting developments in connection with fuel is the treatment of solar and shale oils by the cracking process whereby a light spirit is produced. In order to crack the oil the metal used, namely, iron for heating the oil has been subjected to a very rapid oxidation which has made the process more or less commercially valueless. Recently a new metal has been employed in place of iron which has enabled something like 50 per cent. of light spirit to be obtained from the crude oil. It is calculated that the cost of treating the raw material by this process would be 4 cents per gallon. Bearing in mind the amount of oil-bearing shale in this country it is quite possible that this new process may help to solve the difficulties in connection with the existing supply of gasoline. The only objection to the fuel produced at the present time is its very unpleasant smell.

—

Buick To Produce Six-Cylinder Car

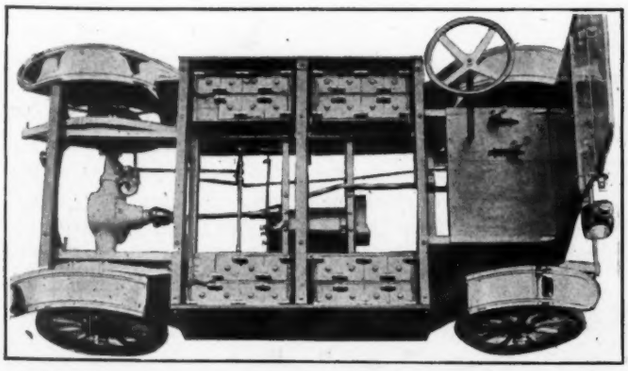
CHICAGO, ILL., April 14—The latest recruit to the ranks of the six-cylinder makers is the Buick Motor Car Co., which is bringing out a six of 60 horsepower, it is stated. The company expects to commence deliveries by the middle of the coming summer. Trial cars are undergoing tests at the factory and complete description of the new product will appear later. The Buick company refuses to give out any details at present.

—

Motocart Co. To Build Cheap Wagons

NEW YORK CITY, April 15—The formation of the Motocart Co., incorporated at Albany with a capital of $250,000, has been announced today. The officers of this company, which purposes to build a $400 light delivery wagon, constructed on a principle similar to the motorcycle, but with four wheels, are: A. R. Gormully, formerly with the United States Motor Co., president; Wallace Odell, a newcomer in the field, vice-president and treasurer; B. G. Knerr, formerly with the United States Motor Co., secretary.

The company will issue $50,000 of stock as the first move and a factory with over 30,000 square feet of floor space will be opened in Tarrytown, N. Y., in the near future. The offices of the company in this city are located at 1790 Broadway.



Grinnell electric 1,000-pound commercial vehicle chassis

Grinnell Builds Trucks

—

1,000-Pound Electric Vehicle Has Four Speeds

—

DETROIT, MICH., April 14—Although not new to the manufacture of electric vehicles, having brought out its first electric passenger car some 7 years ago, the Grinnell Electric Car Co., Detroit, is just entering the business vehicle field, having placed upon the market an electric truck of the light delivery type. Though there is an increasing demand for this class of motor vehicle for all kinds of light delivery service, a brand new field has been opened up with the coming of Uncle Sam's parcel post, and, like a number of other makers, the Grinnell concern has risen to fill the breach, so to speak.

The new Grinnell is styled an "All-Purpose" vehicle and while its rated capacity is 1,000 pounds, it is designed to carry loads 50 per cent. in excess of this amount if desired. Referring to the illustration of the chassis which is shown herewith, it will be noticed that the most distinctive feature is the method of carrying the battery. This is carried in two boxes located amidships and outside of the frame, fifteen cells being placed on a side. This construction makes for even weight distribution and gives plenty of room within the frame for the placing of the motor and drive members.

Motor Hung Under Frame

The motor is made specially for the Grinnell construction and is hung under the upper level of the side frame rails from two cross-members. The motor is not directly connected to the drive shaft, but is mounted to one side of it, connecting through reduction gearing, as shown. In the standard construction a nineteen-plate, thirty-cell W. B. T. battery furnishes the current to the motor. The jars are of the "no wash" type.

The controller is of the drum type, affording five forward speeds and reverse. These speeds are 3, 5, 8, 12 and 16 miles an hour, while the battery mileage ranges from 75 to 95 miles on a charge. Steering is by an irreversible wheel, it being placed on the left, together with the control pedals.

As already noted, the drive is through shaft leading directly back to the rear axle. The shaft is fitted with two universal joints, one just back of the motor and the other at the rear axle connection. Two sets of brakes are supplied, the service pair being operated by pedal, while the emergency brakes, also operated by pedal, are of the regulation internal-expanding type working on the rear hubs. These are 14 inches in diameter and 2 inches in width.

Looking at the more conventional features of the new Grinnell, it is found that the frame is of the pressed steel channel section construction, cross braced with corners reinforced with steel gusset plates. The various parts are carried on annular ball bearings. Springs all around are of the elliptic type, measuring 38 inches in length and having a width of 1 3-4 inches. The fenders are all of the standard metal type.

The wheelbase is 98 inches and the tread standard is 56 inches. As to tires, the option of either the Motz cushion or special electric truck Firestones, 34 by 4 inches, is given.

As to body constructions, the new Grinnell is supplied with either a delivery type or a platform design of any desired dimensions in proportion to the truck size. With the former, the interior dimensions are: Length, 6 feet 6 inches; width, 3 feet 9 inches; height, 4 feet 8 inches. A two-passenger seat is provided which has a comfortable "lazy-back." It is upholstered in machine buffed leather and has a 4-inch hair cushion.

The equipment includes an ampere-hour meter, speedometer, one searchlight placed in the center of the front of the dash, side and tail lights, one interior light, windshield, electric gong and tool kit.

French Army

PARIS, France, March 18.—Horses have been marked down for abolition from the artillery service of the French army. The French, who claim to have the finest artillery in the world, have come to the conclusion that better service can be obtained on the field with motor trucks than with teams of horses.

¶Higher speed and greater mobility is assured with the use of motor vehicles, the degree of reliability is higher, the number of men per gun is less, and all possibility of a battery being rendered useless by a stampede of horses is avoided.

¶Experiments have been carried out for a considerable length of time and such satisfactory results have been obtained that it has been decided to make use of motors in place of horses for all the regiments stationed in Africa. For the time being mechanical traction is being used for the heavy 220 millimeter guns, the lighter arms still being served by horses.

¶Orders have been placed with automobile manufacturers for special types of four-wheel drive tractors and some of these were put through their paces last week on the military grounds at Vincennes, to the east of Paris. The accompanying illustrations show some of the scenes at these demonstrations. The vehicles were supplied by Panhard & Levassor and Messrs. Dalachowsky & Caire.

¶The program called for an ability to haul a load of 12 tons over any kind of ground

Truck Tests

on which horses could operate. The tractors took in tow a line of gun carriages and ammunition wagons, the first carriage bearing the 220 millimeter gun, and was called upon to haul it over every kind of ground on which horses had successfully ventured.

¶The most severe tests consisted in taking the load up very steep banks of soft earth forming the background to the artillery firing ranges. The earth was either so soft or so muddy that there was very little grip for the wheels, yet all these tests were successfully accomplished.

¶In the mud-plugging competition the machines had to go through mud reaching to the hub caps.

¶Another test was the ability to get over the trunk of a big tree which had been laid across the track and pinned in position to prevent it being pushed out of the way by the wheels. This was also done successfully.

¶Finally, there was an immersion test, the Panhard tractor being taken down the muddy river bank under its own power and run into the stream until its wheels were entirely under water, the frame members just being submerged. After remaining in this position for a little while, the machine was brought out under its own power.

¶The Panhard & Levassor tractor is a six-cylinder machine with its motor under a bonnet and a platform body carried behind the driver's seat.

Non-Poppet Motors Influence Poppet Types

Easier valve stem operation secured by use of rockers and lubrication

Part III

By E. P. Batzell

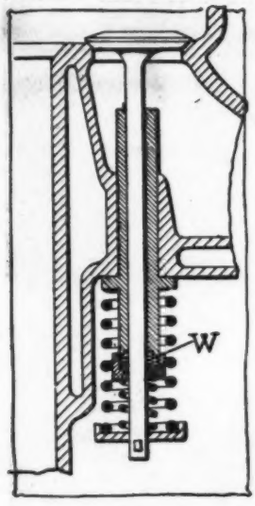


Fig. 5—Method of lubricating valve stem

IT has been mentioned that valve-lifting rockers are used partly with the idea of reducing wear in the tappet bushing by relieving it from the side thrust of the cam action. A very clever arrangement for the same purpose has been brought out recently by Panhard-Levassor, which are the only poppet-valve motors up to the present possessing a special and original construction made solely with the object of avoiding the consequences of worn tappet guides. The method is illustrated in Fig. 6. The tappet bushings have been entirely discarded, and instead, the tappets are guided at their lower ends in specially formed lifting rockers R, and at the upper ones around the ends of the valve stems. The side thrust arising from the cam action is wholly taken up by these rockers through their pivots. These pivots are formed in small circular doors D, which are fitted in pairs to the crankcase by bridge clamps. The tappets proper are quite long, which reduces their possible angularity with the straight vertical direction due to not absolutely perfect alignment and also to the swinging of their lower ends around the rocker pivots. A great angularity in this place, constantly changing with the motion of the valve could have harmful effects upon the valve stems and their guides by working them loose. There is no provision for adjustment of the clearance between the valves and the tappets, except by shimming the bottom of the upper tappet socket into which the valve stem enters. This shimming is easily done here, because by lifting the valve out of the tappet the latter can be directly picked out of the mechanism. Moreover, the method of tappet adjustment by shimming when once properly done generally retains its permanency longer than the common adjustment by screws.

The tappets and valve stems of the Panhard-Levassor motor are inclosed from outside influence, but their compartment is connected with the interior of the crankcase, whereby an adequate supply of lubrication should be assured. This is of particular value to the valve stems.

Valve stem lubrication is just as important as that of any other moving motor part. Thus far it has been grossly neglected, notwithstanding the trouble universally experienced with worn valve guides and sticky valves, both largely due to absence of lubrication. Various means of individually supplying lubricant to the valve stems, as, for instance, by greased washers under spring tension, as seen at W, Fig. 5, have been tried, but these arrangements have not proven to be satisfactory. The mentioned features of the Panhard-Levassor in having the interior of the crankcase open into the tappet and valve space offers a far better and at the same time a very simple solution of this problem, and one which promises to be a big success. Some other motors use the same idea of connected valve tappet chamber and crankcase, and it is difficult to say whether the credit for this arrangement belongs to the Panhard-Levassor or to someone else. In this country the new Garford six has a construction which, although entirely different from the Panhard-Levassor, nevertheless follows the same principle.

In the foregoing are practically covered those means which have been devised and actually employed to silence poppet valve action. They all involve increased cost and complication of the motors, in their construction as well as manufacture, a fact which thus tends to bring nearer in this respect the two motor types, giving the advantage to the non-poppet engine.

This competition between the motors extends over other lines besides that of silent valve action. The constant positive character of valve opening in almost all non-poppet valve motors is a feature that has stimulated improvement in this direction of the poppet valves. A great deal of noise is generated when the positive operation of poppet valves is interrupted, for instance, at high speed when the valve parts cease to follow each other in their motion. This occurrence bears on the strength of the valve spring and the lightness of reciprocating valve parts. Of late considerable improvement can be noticed in the introduction of lighter parts and in cam action giving the least possible change in their inertia motion. The springs are made somewhat heavier benefiting the silent motor range. The camshaft, tappets and valves are more carefully made to withstand the greater amount of work imposed upon them by the heavier lifting to be done without bad effects upon the parts.

Large Valves Affect Operation

This problem of positive valve operation, however, has been hampered somewhat by the present tendency towards larger valve lifts for the sake of gaining a larger valve opening, thereby giving more power and efficiency at high speed. There does not exist a poppet-valve motor which could rightfully claim uninterrupted positive valve operation at its highest speed. Some remarkably good high speed performances with poppet-valve motors have taken place in special instances, but failed to be repeated by the average product. Moreover, the valve gear noise of such motors in action indicates that its motion was far from positive. This field still belongs to the non-poppet valve motor practically undisputed, though it is probable that the poppet valve motion has not yet attained the limit of perfection.

Another feature in which the non-poppet valve motors remain more advanced is their ability to preserve a permanent gas-tight sealing of the valve ports when closed. On the other hand, the poppet valves need more or less frequent grinding-in to keep them tight. Of course, there are also non-poppet valve systems which leave much to be desired in the matter of valve leakage, but generally the rate of their tightness is very little influenced by the amount of service rendered by the motor.

Hardly anything has been done to improve the poppet-valve motor so as to render its valves tight for a long time. Better

selection of material for the valve heads has been made, the size of the valves has been decreased to prevent their warping, double inlet and exhaust valves have been used, special self-seating valve heads have been tried, but the results have not encouraged a widespread use of these improvements.

A marked change in the improved exterior appearance of poppet-valve motors is noticeable of late, which purely and simply has been made under the influence of the non-poppet type. In the non-poppet valve motors the cleanliness and simplicity of the exterior is due to the generally complete absence of exposed valve mechanism parts, to the simplicity of the valve drive construction, the absence of caps and other small paraphernalia attached to the poppet-valve motor.

External Appearance Simplified

An important improvement brought about by the introduction of the non-poppet valve is a desirable simplification of the motor exterior. This is due in a large measure to the extensive use of valve covers for the purpose of protecting the mechanism from dust, etc., and the outsider from the noise of operation.

More motors are built now with separate cylinder heads from the main cylinder casting, which also helps materially towards a simple, clean upper structure, when the design is properly worked out. Their upper structure closely resembles that of the non-poppet valve motors, being free from valve caps and small details. The casting integrally of the main cylinder block with the upper half of the crankcase goes parallel with the separation of the cylinder heads from this block. This eliminates the unsightly flange fastening of the cylinders to the crankcase, still so common in the majority of motors. Although this last trend cannot be attributed solely to the influence of the non-poppet valve motors, nevertheless it can be traced back to that source.

In the matter of power development, endurance and efficiency the poppet-valve motors have advanced a marked extent. The details of construction affecting these items all underwent a number of improvements, so as to bring the motors close to the results obtained with the non-poppet valve type. It is difficult to distinguish present superiority of either of the motor types over the other, except in the matter of endurance, where the non-poppet valve motor succeeded to pass through more severe tests than the poppet-valve. Nevertheless it should be mentioned that in single instances with particular care the poppet-valve motor has been able to demonstrate equal ability with its competitor. The poppet-valve motor lacks in minor details of the valve mechanism, like valve springs, sticking or leaking of the valves, etc. Its power output and efficiency have been increased even in the average product by the extensively used large valves and valve lifts, the value of which has been disclosed to the public practically simultaneously with the publication and general discussion of the early performances of the Knight motor in 1908-1909.

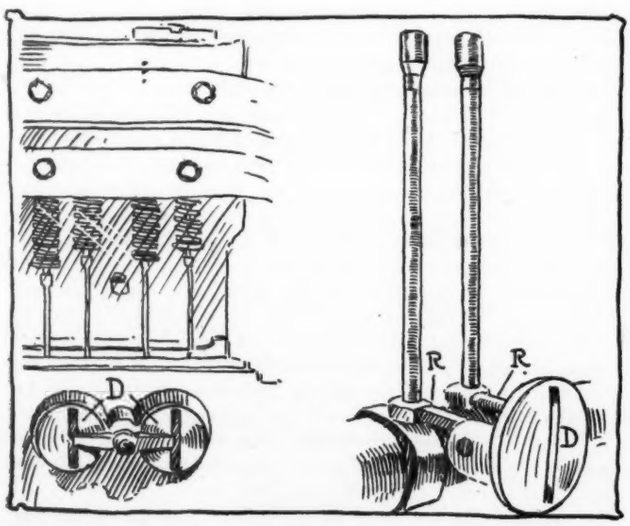


Fig. 6—Use of easily removable rockers under valve stems of Panhard-Levassor motor

Concerning compression pressure the poppet-valve motor undergoes a turn at the present time, namely, towards somewhat higher pressures than that of a few years ago when the tendency was to lower it. The higher compression is essential for competition with the non-poppet valve motors, which generally are of such a construction that high pressures are permissible without causing harm to their action.

Referring to constructive simplicity, this point has not presented itself as an immediate requirement for an advantageous comparison between the two motor types. The fact that the really successful non-poppet valve motor, like the Knight, cannot boast simplicity has given encouragement to the appearance of the poppet-valve lifting mechanisms of increased complication over the common arrangement and, although the greater complication of some poppet-valve systems may be serving some good purpose in the perfection of their action, it remains undesirable, particularly in view of the continued development and improvement in the simple type of non-poppet valve motors.

This could serve as an explanation why only few motor makers have followed the tendency to obtain a somewhat better valve performance at the cost of simplicity. The majority of motor makers are trying to improve their products while retaining its simplicity. Should they fail by those means to approach the existing advantages of non-poppet valve motors, the appearance of practically successful and at the same time simple types of the latter should become the moment of a general turn in the industry and in the public towards adopting and using them.

—

Transverse Vibrations in Stationary Shafts

—

¶ *From a paper read before the Society of Automobile Engineers by J. M. Thomas.*

—

Consider the case of a long, slender stationary shaft supported at the ends by bearings which exercise no restriction on bending. Let the shaft be loaded in the center. Let the load be suddenly removed. The elastic forces are now unbalanced and transverse vibrations are set up; the frequency, or number of vibrations per second, being termed the "natural frequency" of the shaft.

If left alone, all the energy in the shaft will ultimately be dissipated in internal friction and in friction between the shaft and the air; but considering one complete vibration we may say that the total energy in the system is constant. In the mean position the energy is wholly kinetic. At the ends of the path of vibration the direction of motion is changed, the shaft is for an instant stationary and the energy is wholly potential, or strain energy. The stress in the shaft has now its greatest value, and the greater the amplitude of vibration the greater will be the stress.

Moreover, the stresses are of an alternating character and we know from the researches of Wohler and others that the stress intensity, when of the alternating kind which will produce permanent distortion, is less than under static conditions. When a periodic force acts upon the shaft forced vibrations of the same frequency as that of the force are set up, the amplitude of the vibration depending upon the relation between the frequency of the force and the natural frequency of the shaft.

As an illustration: The vibration of a headlight, or mud guard, which may frequently be observed on cars standing with the engine running at a slow speed, are forced vibrations of this type. If the frequency of the force is the same as the natural frequency, it then at each application acts in the direction of motion and increases the amplitude of vibration, or greatest deflection; the kinetic energy of the system, and what is more important the stress at the extreme points of the path of vibration. The continued action of the force under these conditions will evidently result in stresses beyond the elastic limit and the shaft will either fracture or become permanently bent.

The Engineering Digest

A Digest of Technical Information from the Engineering Journals

Some Principles in the Action of Tires and Vehicle Springs Succinctly Expressed and Limned by Celebrated German Authority—Short-Circuiting Magneto Current Against Car Thieves—Two Motor-Starting Devices, One by Maybach

RIEDLER on the Action of Springs.—Among writers on technical automobile subjects *Geheimer Regierungs Rat* Professor Dr. Riedler of the Technical Highschool at Charlottenburg, Berlin, has attracted universal attention by his books on Scientific Automobile Valuation, in one of which he published very elaborate test data relating to different modern motors and presented the conclusion that the double-sleeve valveless motor was intrinsically unfit for further development because it could not be cooled easily enough for a continued maximum development of its power without an uneconomical excess of lubrication and other heroic means. His unreserved expressions gave rise to heated polemics between him and the producers of Knight motors in all European countries and these have continued until now since last summer and have contributed to a close examination of all the intricate questions involved in the subject. Meanwhile Dr. Riedler has taken pains to show his versatility by sending interesting descriptions of an automobile trip in the Balkans and recently by writing a relatively popular treatise on automobiles for the encyclopedic work *Die Technik im Zwanzigsten Jahrhundert*. Some of the terse technical ginger which abounds in his more strictly scientific publications crops out also in this work. He does not take the motor as the factor which must first of all be understood by one who desires to study automobile requirements, but the relations between a wheeled vehicle and the actual roads. Some extracts from his presentation are given in the following.

The traction resistance of a vehicle on a good level road amounts to about 20 kilograms for each 1000 kilograms of load and on rails only to about 4 kilograms. On account of this single advantage, the entire transportation traffic, including goods and passengers, has been condensed in an unnatural manner upon a few already greatly overloaded steel rails. [Riedler underrates perhaps the importance in this respect of automatic steering, by rail, and of the relative independence of weather and seasons.]

Knowledge of automobiles can be gained only by studying the fundamental conditions for their work and not from a hodgepodge of machine-technical details which moreover, to be understood, call for specialized knowledge, while the foundations are intelligible to every person with a general scientific education.

In contrast with the railway, the automobile may be characterized as a power vehicle for the common road, but this a road which is not built for it and therefore poorly adapted for speed. Nevertheless the motor vehicle must be driven over it three times as fast as a horse-vehicle of the same class. And in all cases the load is greater in the motor vehicle, and the time for its operation is not limited by fatigue. The tripling of the speed is therefore an enormous demand to make and can be realized only by a highly developed specialization of the means.

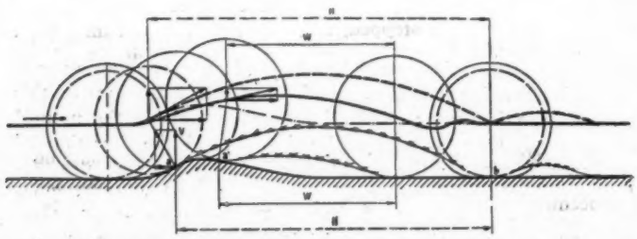


Fig. 1—Movements of running-gear with hard tires and with soft tires occurring when vehicle strikes road obstacle

[Dr. Riedler here goes on to show that the great differences in the construction of automobiles of the different classes are necessary and natural, all being due to the need of compromising with the very severe requirements; a compromise which of course must vary in its nature according to what is most important in each type of vehicle, considering its purpose in each case.]

The running, the steering and the driving are the most fundamental functions of an automobile to be looked into, and, with regard to the running, the actual condition of roads makes it a first consideration how a vehicle may be driven as fast as required over numerous obstacles without injury to it and its occupants. The object must be to reduce the force of impacts to a minimum and to control them by a successively acting spring resistance. For this purpose it is indispensable to subdivide the acting masses by means of the springs and to reduce the mass which is not spring-suspended through the use of very high-class materials. Wheels and axles, which constitute the unsuspended weight, must be made as light as possible. While the careful driver who avoids shocks and circumvents obstacles is the principal factor in lengthening the life of a car, the use of high-class materials to reduce weights and masses stands as the most important factor of progress so far accomplished in automobile construction. These materials—the alloy steels in forgings and castings—have fitted the automobile to survive normal wear and tear at the required speeds.

The springs between axle and body divide the entire vehicle bulk into an unsuspended running-gear and the larger spring-suspended mass of the body and load. The springs must take care of the equalization of impacts between these two masses. Springs cannot absorb or anul impacts but can only transform them and at once transmit them or return them in subdivided form. The impact places the spring under tension, but it cannot remain in this condition. It must give up the energy stored in it by a rapid spring-extension, and the object is to have it return this energy to the running-gear and not to the vehicle body. In a correct spring suspension the force of impacts travels therefore to and fro, from the road to the wheels and the springs and back again to the road, the wheels and axles swinging rapidly, while the wagon body remains at an almost undisturbed level. Only when the spring is prevented from at once reacting upon the axle, the spring rebound must take effect upon the wagon body, which is never desirable.

For fast driving the force of an impact must be reduced at once at the spot where it is received; that is, by a spring action

at the circumference of the wheel. The time between impacts is too short to admit of any other method. Springy tires are therefore an indispensable requirement for speedy driving.

When a hard tire (see Fig. 1) is driven against an obstacle and the vertical component of the impact is greater than the axle load, the wheels and axle are thrown upward from the road. The actuated mass follows the parabolic curve H and the wheels reach the road again at *b*, whereafter there follows a series of diminishing reflex bounds, unless a fresh impact intervenes. But if an elastic tire is driven against the same obstacle it is locally compressed and operates as a first element in the cushioning of the shock. Consequently the curve W of the bound becomes shorter and the wheel returns quicker to contact with the road. Only that portion of the impact which has not been transformed in the tire reaches the vehicle springs, which return it to the running-gear.

The spring is before the beginning of the impact under its normal load, as represented under I in Fig. 2. By the impact it is compressed (II) and immediately rebounds. When the wheel again hits the road, the spring is again extended. The larger mass of the vehicle body participates only very little in this movement, because the short time of the spring action suffices only for accelerating the small mass of the running-gear but not the larger one of the body and load.

From these few kinetic principles it is possible to assign rational causes for many important experiences in driving, and by reasoning from them many arrangements of springs and tires may be recognized as correct or faulty.

For example, vehicles not provided with cushioning devices must necessarily either rise above every road obstacle or smash it; a large amount of lost work, resulting in the destruction of both the road and the vehicle. Motor vehicles without a spring suspension of some kind are therefore impossible. Hard tires on otherwise correctly spring-suspended vehicles answer only for speeds up to about 12 kilometers per hour. At highest speeds the impacts of the unsuspended running-gear become too severe, and likewise the destructive effect upon the road surface, because the cushioning at the locus of the impact is missing. [Here follows an exposition of the great and indispensable advantages of air tires for all fast driving and also of the unavoidable economical drawbacks, power losses and inconveniences in their use.]

The second element in the spring suspension is the real vehicle springs. These can operate correctly only for one given load and speed. By reason of the transformation of energy in the springs vehicles run more quietly fully loaded than partly loaded, if the springs are designed for the full load. On good roads fast driving is steadier than slow driving and heavy vehicles steadier than light ones, but on a poor and rough road this is reversed. Heavy vehicles run smoothly over cobble stones and similar surfaces when driven fast, but not otherwise, while light vehicles never run steadily over such a surface. All of this may be inferred from the time required for accelerating the large mass of the vehicle body and load. In running over a ridge or a furrow the wheels no longer hit the road level but the higher or lower surface of the obstacle, and the vehicle

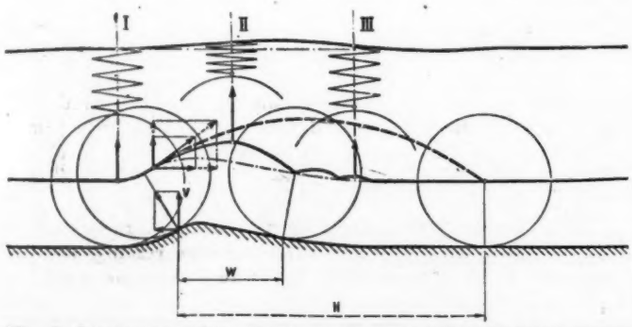


Fig. 2—Successive positions of running-gear and of vehicle springs when fast-driven vehicle strikes ridge in the road

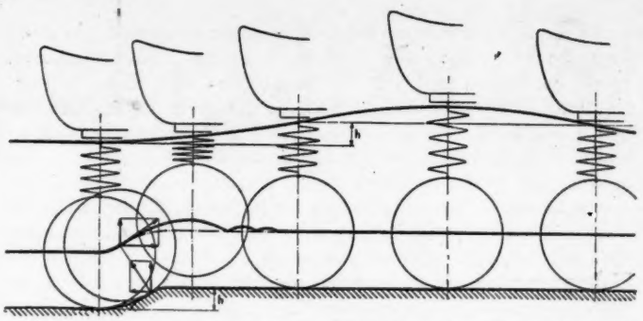


Fig. 3—Effect on vehicle springs and body when the springs are prevented from extending downwardly after a jolt

spring, after being compressed by the first impact, has no chance to rebound toward the ground but must spend its stored energy upward against the heavy vehicle body, which is thrown upward until the springs are entirely extended, as shown in Fig. 3. By this action the vehicle body is unavoidably thrown up so high that, when it comes down again by gravitation, it compresses the springs till the frame comes down hard against the axle. Such excessive oscillations of springs can only be avoided by cautious driving. Something similar occurs on undulating roads. Here, too, the springs get time to accelerate the vehicle body upwardly, and intolerable swinging movements are set up, sometimes.

A stepwise distribution of the spring action is recommendable also in the case of the vehicle springs. For this reason auxiliary springs are secured at the ends of the leaf springs. These enlarge, when properly designed, the range of the spring movement and take effect first, in advance of the slower-acting leaf springs. By this means it is possible to make a closer compromise in suiting the suspension to different loads, speeds and road conditions. Dampers on the spring action can be justified only when they guard against excessive upward movements of the vehicle body. They should therefore take effect only at the moment when such movements begin but not before. Most dampers, and particularly all the elbow-joint dampers work on just the opposite principle and are therefore valueless. Hydraulic dampers can be made to operate correctly but are too complicated [*umständlich*]. Elastic wheels with interior springs can work only like vehicle springs but can never supplant elastic tires, being unfit for absorbing an impact locally. Moreover, such springs work only in the wheel plane, while the shocks come from all sides.—From *Automobil-Rundschau,* March 15.

—

STARTING on the Spark.—In order to be able to start a motor on the spark, the mixture contained in the combustion chamber must be ignitable in the immediate vicinity of the spark plug terminals. Owing to the higher specific gravity of gasoline vapor as compared with air, a mixture left standing in a cylinder will stratify, the air going to the top, and only the middle strata will be in a proportion that makes it inflammable. The first condition for being able to start easily on the spark after the motor has been at rest for some time is therefore that the spark plug extends well down into the mixture. When the gases are churned by cranking, this favorable location of the plug is less urgently required. As the relative amount of vapor to air is small, as rich a mixture as possible should be left in the cylinder when the motor is stopped, so as to raise the inflammable portion to the highest possible level. The longer it is intended to stop, the richer the mixture should be, as every minute of delay makes the vapor sink to a lower level. It is the wrong method to open the gas wide when stopping the motor, as a wide-open carbureter does not give the richest mixture. Assuming that the plug is well located and that the carbureter is normal, the procedure can be varied according to the length of the intended stop. For one of five minutes it is enough to throttle down somewhat and effecting the stop by cutting off the ignition. For a stop of fifteen minutes, close the air-shutter after cutting out the

ignition and open it again before the motor is stopped, but don't race the motor. If the stop is to be for two-three hours, speed the motor to about 800 revolutions and close the air-shutter. For a still longer wait, as for over night, race the motor and block the air. These rules are of course subject to variation according to the type of motor and the weather. The mixture left in the cylinders should be richer for cold than for warm weather. At zero temperature it may be impossible to start without cranking first, but one turn will generally churn up a well-prepared mixture sufficiently.

With carbureters which have no additional air inlet to be operated, the mixture can be enriched, even to excess, by speeding the motor up and then throttling down tightly and suddenly. —Henri Petit in *La Vie Automobile*, March 22 and April 5.

—

MECHANICAL Motor Starter.—While the mechanical type of motor starter may be destined to give way in course of time to one which is more intimately built into the motor system, rather than constituting an accessory mechanism, it still has advantages in the way of low cost and reliability—though only the same limited kind of reliability which the old starting-crank offers—and these appeal to a portion of the public. One such device, known as the Rofill, is now being pushed in the Belgian market and is illustrated in Fig. 5, in which the portion to the left represents the parts close to the driver and that to the right the parts located in front of the motor. The operating

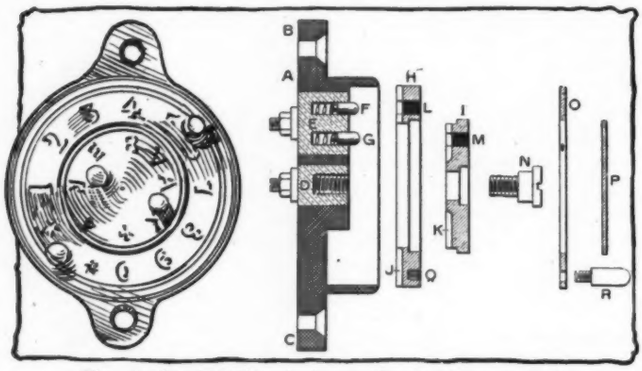


Fig. 4—Combination lock on the ignition current

lever 24, when pushed forward, actuates another lever 18 by the mesh of gear sectors 22 and 20, the motion being resisted by the spring-rod 21, which is attached to lever 18, and the cable 14 extends through or under the motor hood to the pulley 17 and, around it, to the end of arm 12 of the free-wheel device 9, being always kept taut by the tension of springs 21 and 13. The starter-shaft 2 has a bearing in front in the piece 1 usually supporting a starting-crank [the whole device being intended for application to old as well as to new vehicles] and is connected to the motor shaft 4 by a ball clutch inside of sleeve 6 which is pinned to the motorshaft. But this clutch ceases to operate when the motorshaft is turned fast, as the balls are then, by the centrifugal action, thrown into recesses formed in sleeve 6. The operation now consists in pushing the lever 24 forward, thereby extending spring 21 and detending spring 13, the latter taking the free-wheel into the position, with the arm 12 downward, in which the cable acts most favorably, and thereafter pulling sharply back upon lever 24 with the assistance of spring 21. If the motor should backfire, the shock will be absorbed for the greatest part in spring 21, the strength of which is calculated for this eventuality. A side view of the interior of the free-wheel, in which 10 is the ratchet and 11 the pawls, is given in one corner of the illustration.—From *Automobile-Aviation*, March 20.

—

COMBINATION Lock on the Ignition.—The device shown in Fig. 4 serves to short-circuit the magneto, as a protection against automobile thieves when the owner has left his vehicle at the curb, and it also affords some protection against other unauthorized use of a car. The dial is composed of two concentric disks O and P, the outer one bearing 12 numerals and the inner one 8 letters. Both can be turned by means of small knobs, like R, which also secure them to the corresponding interior disks H and I which are mounted together on the shoulder of the assembling-screw N. The body A is made of ivorine, an insulating hard-rubber substance, and the metallic plug D is wired into the primary magneto current, a terminal post being provided for the wire attachment, while the other metallic plug, E, is grounded. Unless the spring-knobs F and G are opposite to and in contact with the fiber plugs L and M rather than with the bodies of the disks H and I, the magneto is thus short-circuited. To change the combination the dial-disks O and P are brought in different relations to disks H and I—a new numeral opposite to plug L and a new letter opposite to plug M. This, it is said, may be done by loosening the knobs R and re-securing them in new positions. [There must therefore be a series of threaded holes, similar to the one marked Q in the drawing, in both the interior rings.]—From *Omnia*, March 8.

—

STARTER for Airship Motor.—In connection with a six-cylinder motor designed by Karl Maybach for a new German air-cruiser, a patented starting device has been installed, and it is reported to have worked perfectly at trials of the airship. By means of a single lever all the valves of the motor are raised at the same time, and by the same lever action, a rotary valve is operated which closes the exhaust exit from the muffler and opens instead a conduit leading to a vacuum pump. A few pumping strokes send rich explosive mixture from the two carbureters to the cylinders, whereafter the motor valves are closed again and the exhaust is opened. The motor is then started by actuating a Bosch magneto-booster.—From *Allgemeine Automobil-Zeitung*, No. 12.

—

Properties of Benzol.—Gasoline contains 85 per cent. carbon, 15 per cent. hydrogen and boils at 70 deg. centigrade, while benzol contains 92 per cent. carbon, 8 per cent. hydrogen and boils at 80 degrees. As the hydrogen content makes for rapid flame propagation and increased power but also for easy ignition, the compression used with gasoline cannot be as great as that which is practicable and desirable with benzol, and as in turn the higher compression makes easier ignition and increased power, the question of the relative efficiency of the two fuels depends largely upon the construction details of the motor—the shape of the combustion chamber, the nature of the ignition and the design or adjustment of the carbureter. As, however, the larger carbon and smaller hydrogen content of the benzol militates against much variation of the proportions of the explosive mixture, while practically all modern carbureters do change these proportions with the speed, the flexibility of the motor cannot be so great with benzol, if by flexibility is understood, as usual, that increase of torque at lowered motor speed which renders it possible to avoid gear-changing to a considerable extent.—From *Allgemeine Automobil-Zeitung*, March 21.

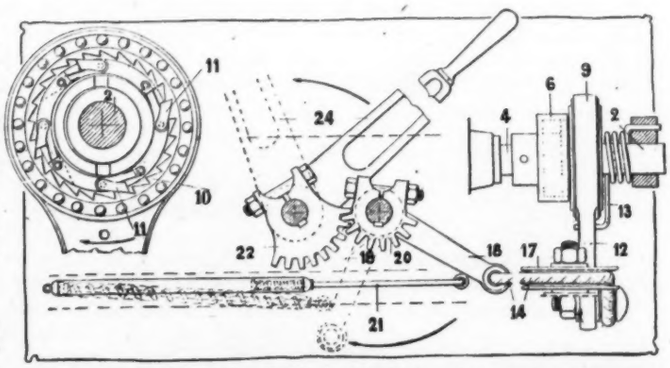


Fig. 5—Elements of the Rofill mechanical motor starter—Drawing in left corner represents interior of the free-wheel 9

The Engineers' Forum

Horsepower as Basis For Tax Discussed

Part III

Automobile Engineers Express Dissatisfaction with the Principle of Levying Fees According to Horsepower of Car

Cunningham Satisfied with S. A. E. Power Rating
Apperson Says Rating Should Be Lowered, if Anything
R. P. Henderson Is Satisfied with S. A. E. Rating
Creighton Considers S. A. E. Formula Accurate

SO many letters have been received by THE AUTOMOBILE from prominent automobile engineers, expressing their opinions as to the ideas embodied in the article entitled "Cars Taxed on Unused Horsepower," which appeared in THE AUTOMOBILE for March 27, that the Engineers' Forum for next week, and perhaps for the week following, will be devoted to the discussion of this timely subject. Some of these letters are given herewith:

Base Tax on Cylinder Development—Cunningham

ROCHESTER, N. Y.—Editor THE AUTOMOBILE:—The tendency on the part of state legislatures to provide new horsepower ratings seems to me to be entirely called for. The present S. A. E. rating certainly is fair enough. It represents, as a matter of fact, a great deal higher horsepower than the average developed by automobiles on the road. A car whose motor rates 30 S. A. E. does not develop more than 15, as an average, in ordinary touring, and considerably less than this for ordinary city driving. If automobile taxation is to be based upon a horsepower rating, the S. A. E. formula should be in every way adequate. If any change is made it should be to base taxation on actual cylinder development.—JAMES CUNNINGHAM, James Cunningham, Son & Co.

Rating Should Not Be Increased—Apperson

KOKOMO, IND.—Editor THE AUTOMOBILE:—I am glad to have an opportunity to express myself on the movement which seems to be on foot among many of the secretaries of the different states to force a change in the horsepower rating of automobile motors. I have been watching with interest the reports that have come through the press of the agitation on this subject which is being stirred up in different localities as a result, undoubtedly, of the publicity which is being given just now by many manufacturers to long-stroke motors.

Realizing that such action would be in direct opposition to the service which the majority of public officials seek to give the people—that is, it would be inimical to the interests of the motoring public at large—we are anxious to set forth what our experience in getting the horsepower out of gasoline motors has been.

At the start, when the A. L. A. M. horsepower rating was first promulgated, I was of the opinion that it was too high. But as we continued to apply it to engines as we built them and tested them out here we found it was a very accurate formula for the determination of the horsepower of a motor on the block. It does not give the maximum horsepower our engine will develop under the block test but as an indicator of the power which will be obtained by the driver on the road it is in our estimation, far too high. In making a statement of this kind I mean that the average user of a car is not sufficiently educated mechanically to keep the mechanism of the motor in such condition as to enable it to develop 100 per cent. efficiency at all times. In my opinion, the majority of cars in the hands of users, owing to changes in adjustments which are made by them, do not develop anywhere near the horsepower shown by the block test when they are tested before shipment. This loss, therefore, would bring the horsepower down below that given the engine by the standard A. L. A. M. formula. So by increasing the rating and thus boosting the license tax to the user, you would be asking automobilists to pay for something which they do not get.

It is my opinion that the formula should either be left as it is or revised downward if it is to be changed at all.—EDGAR APPERSON, Apperson Bros. Automobile Co.

Change Would Bring Confusion—R. P. Henderson

INDIANAPOLIS, IND.—Editor THE AUTOMOBILE:—I am inclined to believe that in designing laws to provide a graduated tax or license for all automobiles, basing on horsepower, influence should be brought upon the law-making bodies to adhere to either the A. L. A. M. or the S. A. E. formula.

It would lead to confusion of the worst kind should the states attempt to work out a new horsepower rating other than the above, which are recognized as standard throughout the country.

I recently met with a committee representing the Hoosier Motor Club at our state legislature at which time the above views were expressed and seemed to represent the general feeling of all present.—R. P. HENDERSON, Henderson Motor Car Co.

Makers Should Not Over-rate Cars—Creighton

PERU, IND.—Editor THE AUTOMOBILE:—My opinion is that while the block test of a motor generally shows higher horsepower than the S. A. E. rating, if the loss in power from motor to rear wheels is taken into consideration the actual horsepower of the car will about correspond to the S. A. E. rating. Some motor builders claim an excess rating which may be obtained by a few seconds' pull on a dynamometer and is not to be compared to a constant pull of several hours' duration, such as a car would be subjected to in long trips under unfavorable road conditions.

In regard to the length of stroke altering horsepower rating, as it is being discussed so much at the present time, I would not care to enter into discussion regarding it. If automobile manufacturers in general will not over-rate their cars to more than the actual block test of the motor, I think there would be no criticism to the S. A. E. rating of the different secretaries of the states.—P. L. CREIGHTON, Great Western Automobile Co.

(*To be continued.*)

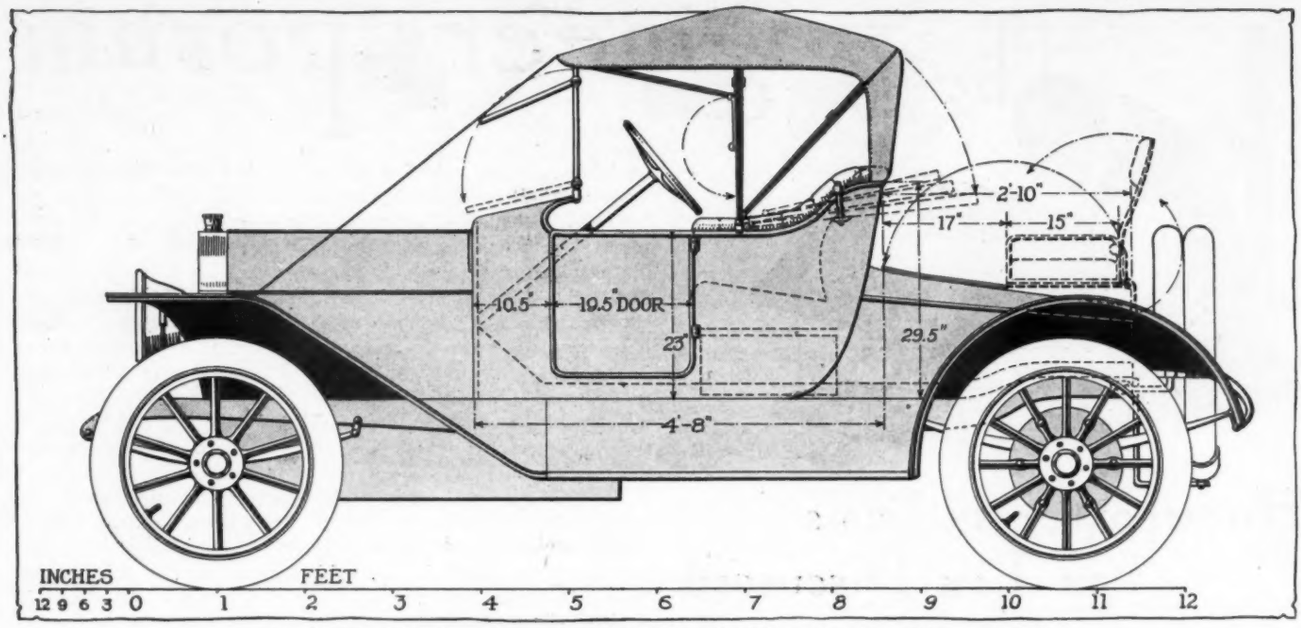


Fig. 1—Elevation to scale of suggested body adapted to chassis of Moon model 39

Design for Runabout Body with Doors

Ventilation of Interior Secured by Oppositely Hinged Doors—Rear Emergency Seat and Luggage Compartment Incorporated

A VERY seasonable type of body design for consideration at this time of the year is the runabout. With the beginning of warm weather comes the call for outdoor exercises and the open air and for purposes of business or pleasure there is no handier type of vehicle for the owner who drives his own car.

The runabout has the advantage over other body types, in being very light, and therefore can be adapted to any chassis. In common with other body types it has adopted the foredoor and it is a body with this door included in the design that is illustrated in the accompanying scale drawings. The particular chassis shown, on which the body is mounted, is the Moon, model 39, having 116-inch wheelbase, 34 by 4-inch tires, left drive and center control and four cylinders, 4 by 5.75 inches.

Fig. 1 shows the side elevation completely worked out in detail. The primary idea of the design is to give comfort and therefore no attempt is made to include features of the racy type. The steering wheel retains the standard angle of the stock chassis, and as it is well back, plenty of leg room can be allowed between the front of the seat and the dash. The left hand drive also adds to the ease of entrance from the right side.

As shown, the body is roomy and comfortable and affords protection in any kind of weather. It has been developed in a thoroughly practical manner to suit the chassis on which it is mounted, and the lines of the design are harmonious and in conformity with general standard practice.

Taking up the design in detail, the accommodation is for two but there is an addition or folding seat at the rear which can be used for a mechanician when touring or as an emergency seat for a third passenger.

The body is made with rounded corners at the rear, and the sides and back are high enough to afford protection and comfortable rest support. The windshield is capable of being turned to any angle desired and in addition to having the storm visor, the shield in its entirety can be folded down over the cowl and be out of the way, in which latter position it also offers the minimum wind resistance.

The body at the dash is made rounded, both from the sides as shown in Fig. 3 and from the top, Fig. 1. The cowl is carried well back and is elevated slightly. A straight line effect is preserved as much as possible, curves only being used where absolutely necessary. The distance from the dash to the door is 10.5 inches and the doors are 19.5 inches wide.

These doors are hinged at opposite sides, that is, the left door is hinged at the rear and the right door is hinged at the front. In warm weather they are held partly open, and the theory is that the pressure of air entering through the door that opens toward the front, will expel the air through the opening on the opposite side and in the opposite direction. This current will assist in cooling the compartment.

Folding Seat Fitted at Rear

The emergency seat is shown by dotted lines in Figs. 1 and 4, the dimensions being included. It is supported at the back by a folding leg that engages in a socket at the rear of the luggage compartment. This socket, although a permanent fixture, is not unsightly on account of its inconspicuous position at the back of the tires. When this folding leg is engaged in the socket, the top ends press firmly against the side supports of the folding lazyback and prevent this latter from swinging with the motion of the car, a condition of things which would not add to the comfort of the rear passenger. When folded down this seat does not extend very far into the compartment, and if it is desired to carry luggage the space occupied by the seat will hardly be noticed. Luggage space is provided at all times at the rear of the seat even when this latter is in commission. The gasoline tank is located under the driving seat and the space allotted will accommodate a tank of approximately 20-gallon capacity.

The top is made of dark colored mohair supported by three bows which are rounded. The front bow revolves on a center below itself as indicated by the arrow, Fig. 1, when the top is being folded down. The arch of the roof or dip at the front and back from a horizontal is greater than usual. This is done to make the front and rear bows short, so that when the top is folded down it will not interfere with the occupant of the rear seat. This folded down position is indicated by dotted lines on Fig. 1. The top is made very light and the front end is secured by straps that fasten to the front fenders. Side curtains are provided for stormy weather and by referring to the rear view in Fig. 3, it will be noted that the celluloid light in the back curtain is larger than is customary practice and is strengthened by running bars of the top material across both horizontally and vertically. In the plan view the top is removed to better illustrate the interior.

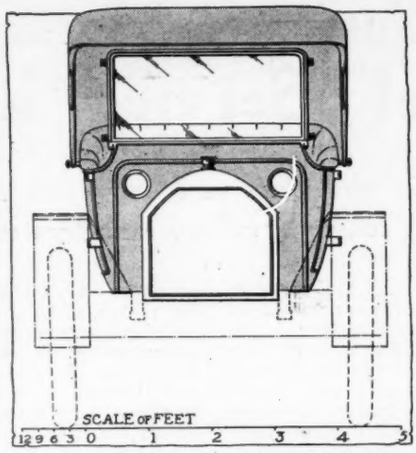


Fig. 2—Front view of runabout with hood in raised position

The construction of this body is aluminum sheet of 16-gauge for the panels throughout, except the perpendicular side and rear panels of the luggage compartment, which are made of steel and joined to the deck sheet under the moulding that runs along the side and back near the top edge. Very few mouldings show on this body, as the main body panels are butted to the panels of the luggage compartment at the rear and on the lower line these panels are turned under and fastened to the body framing. At the front the panels are fastened under a metal moulding that is fastened to the wood dash.

No difficulty is experienced now in shaping up aluminum sheets to the shape required for this design, and a body of this description can be constructed by any bodybuilder having only a simple organization.

Parts To Be Specially Made

Most of the parts of this design will have to be specially made, as for instance the ironing of the emergency seat and the ironing of the front windshield. The fixtures for the hinges for this latter can be purchased, also the curved pattern hinges and the locks for the doors. These latter should have inside or concealed handles. The tubular bow sockets for the top can also be purchased.

The cover of the luggage compartment is hinged with a strong piano hinge at the rear and at the front, each corner is locked and the keyhole covered with a flap. This cover is made watertight by being provided with a flanged edge which fits over a raised coping on the deck.

The standard equipment is used throughout except the rear fenders, which are made to suit the lines of the design. The front fenders are standard as well as the front and dash lamps. Both of these are electric and the dash lamps are set in flush. The tail lamp and tire carriers are standard equipment and remain in their regulation place.

A suitable color combination for this design would be to retain the Bavarian blue used on the stock touring car, for the chassis throughout, with white striping and black fenders. For the body a rich, very dark blue with white striping and white mouldings. All metal parts including lamps either black or nickel and all exposed wood finish to be mahogany.

The trimming material to be black, soft luster, hand buffed leather and the trimming to be luxuriously thick. The pleats to be held in place by small straps in place of buttons, in the same manner as adopted on the standard Moon cars. The seat cushion can be 7 inches deep and still leave 9 inches under the steering wheel rim to the top of the cushion, and the width and length of the body are sufficient to permit of plenty of thickness to the side and back trimming. The covering of the floor boards and the runboard to be cork linoleum trimmed with aluminum.

—

Quick Painting of Metal Bodies

For cars that are required to be painted and finished in the shortest possible time the following system of applying the coats is recommended: First see that the metal is perfectly clean and free from foreign substances. Then apply an approved make of metal primer, which bake for 3 hours at 200 degrees. In the afternoon of the same day apply a coat of knifing surfacer, thinning the material with turpentine to a brushing consistency, and apply with a brush, working the material out very thin and fine. Oven bake for 3 hours at 225 degrees.

The next morning sandpaper thoroughly and apply second coat surfacer and bake the same as first coat. Follow same day with third coat surfacer baking as before. Sandpaper each coat of surfacer. The third day apply sealer coat, a thin material which seals the surface against subsequent sinking in. Bake 3 hours at 190 degrees, then apply coat of japan color.

The following morning apply coat of color varnish which bake for 6 hours at 170 degrees. Next morning rub lightly with water and pulverized pumice stone. Clean up, stripe, and later in the day flow on a quick finishing varnish, which bake for 6 hours at 140 degrees. Next morning the car is ready for service having taken 6 days to paint. The above method produces a satisfactory though not strictly high-grade finish.—From *The Carriage Monthly* for April.

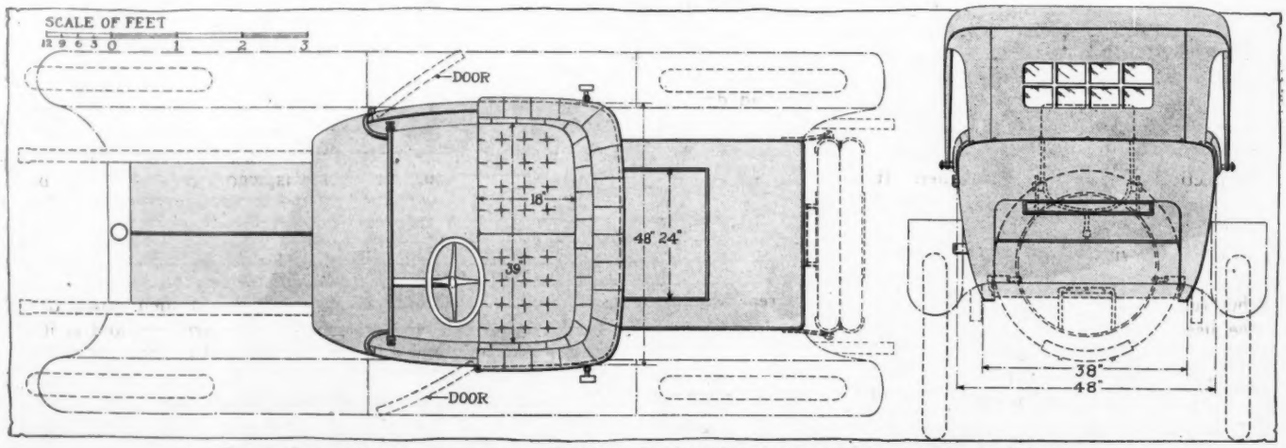


Fig. 3—Plan and rear view, showing method of ventilating interior by arrangement of doors

Stearns Model Service and Inspection

Inspectors Look Over 400 Cars in New York Territory Once in 3 Weeks—Service Plant System

SERVICE, comprising prompt repair of automobiles requiring it, has become an almost general feature with most automobile companies of any standing, especially in the large cities. New York City, for instance, contains fully two dozen service stations where cars are adjusted and repaired in the shortest possible time and at the least possible cost to their owners. This service, which signifies the gradual extinction of the old-fashioned city repair man, has in the case of many commercial automobiles been supplemented by an inspection service. Various schemes of periodical truck inspection and making what immediate repairs and adjustments are necessary, together with a letter to the truck owner, have been described repeatedly in THE AUTOMOBILE. Now, inspection service is being introduced in the passenger-car field as well. The F. B. Stearns Co.'s New York branch is the first to install such system in New York.

The scheme of the Stearns company, which has about 400 cars operating in New York City, is as follows. Three inspectors attempt to see every car once in a fortnight, although often 3 weeks pass between two inspections. It is thought best not to molest the car owners with the inspection service, even though the latter is in force to benefit them; but the inspectors try to get into and to remain in communication with the chauffeurs driving the cars. From them they get information as to how the cars are used ordinarily. For instance, a car may take the children to school in the morning, the master of the house to his place of business, miladi on her shopping trip, etc. On the basis of this information the inspectors can form their ideas of what the cars require, in what respects they must be looked over, what instruction should advantageously be given to the chauffeurs, etc. When an inspector finds that it is time to look over a certain car, he runs up to the garage where the car is stationed at the time of day he knows it is there. He looks over the mechanism, sees whether all parts are properly lubricated and adjusted, then asks the chauffeur to drive him for a few blocks so as to develop what trouble, escaped the garage inspection. He makes notes as to the status and requirements of the car and for the purpose of a report fills out the form, Fig. 3, which is typewritten in blank on a white sheet of office paper, 8.5 by 11 inches. He also has the chauffeur sign the form, to witness that the inspection has been made. Then the inspector repairs to the service department and dictates a letter to the owner, calling his attention to the state of his car, etc.

It stands to reason that an inspection conscientiously carried out every 3 weeks must nip in the bud every growing misadjustment and other trouble, and consequently reduce repair and maintenance cost to a minimum.

The repair service of the Stearns company is likewise of interest, as it utilizes a record system which practically excludes every oversight and mistake, as long as its conditions are closely followed. This system comprises eight blanks, several of which are filled out in more than one copy.

The following forms are used by the Stearns company:

1. Job order.*
2. Job-supplement order.*
3. Working tag.
4. Operation time card.
5. Material requisition.*
6. Purchasing order.*
7. Return-goods order.*
8. Daily time report.
9. Job cost record.

The forms marked with the asterisk (*) are made out in more than one copy.

1. Job Order.—This form, Fig. 1, is made out when a car is brought into the service department to be adjusted, looked over or repaired—in short, whenever it enters the department. The form is 14.25 by 9 inches and all blanks are kept in the main office of the superintendent. In making out the order, all spaces on the blank are filled out, and, by means of carbon

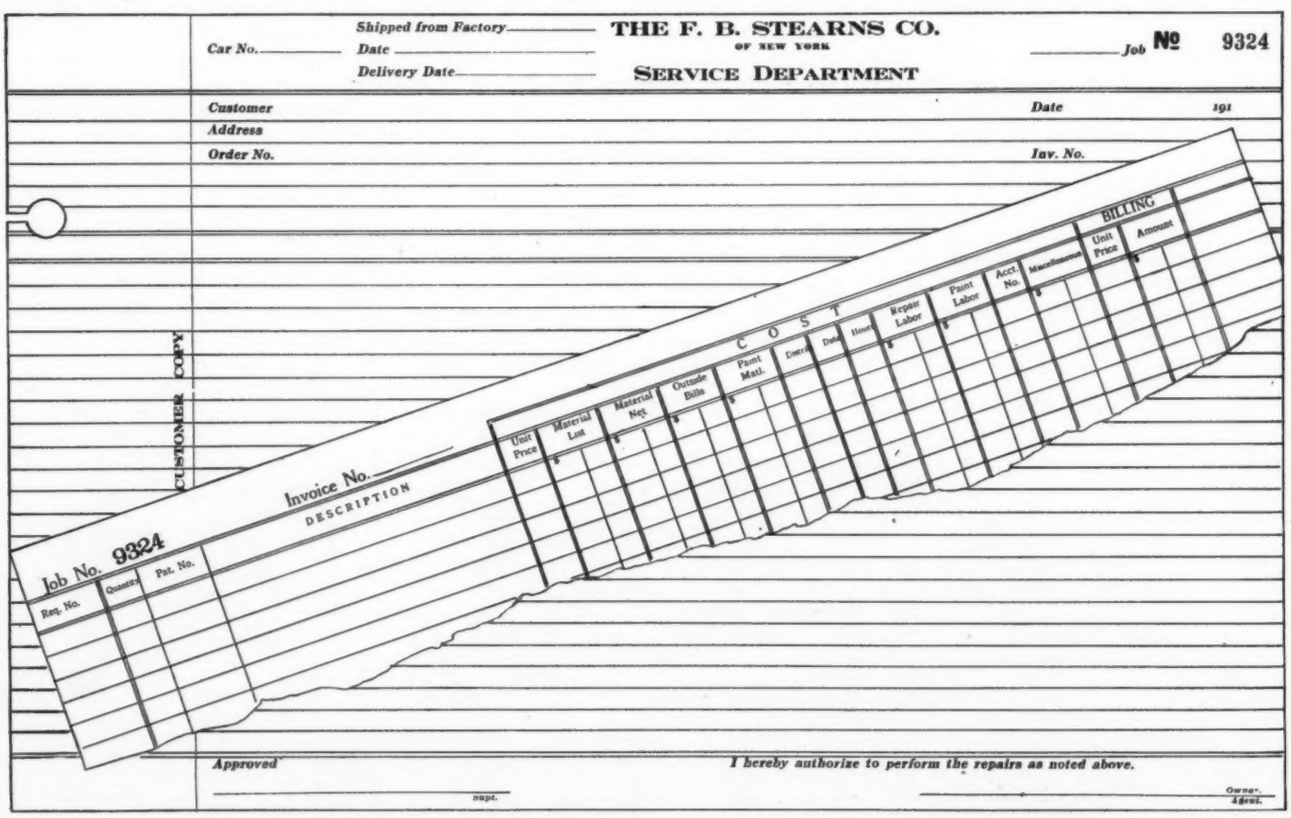


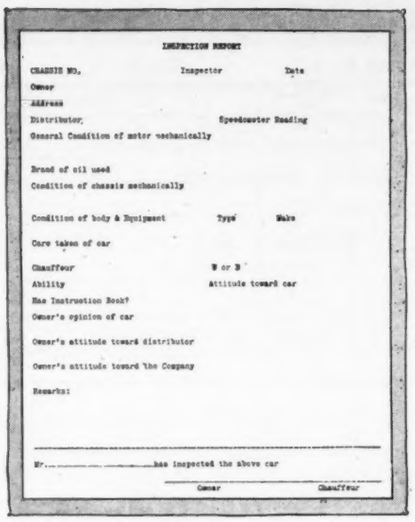
Fig. 1—Job order used in Stearns service department. Fig. 2—Accountant's cost record form

paper, four copies in all are made out, all of which bear the same serial number printed on the form. The jobs are numbered consecutively, but independently. Of course, every number of the blanks must be accounted for. As to the duplicates, one copy goes to the shop, the second to the stockroom, the third remains in the office and the fourth goes to the accountant. The last copy is 14.25 by 18 inches deep, for reasons explained below. All the work to be done having been entered on the order signed by the owner authorizing the repair operations, the order copies are distributed and the work is started, the various departments receiving the car in turn.

2. Job Supplement Order.—This form, Fig. 9, which is 5 by 9 inches, is used when an owner orders repair work after his car has already been delivered to the shop. As its name implies, this order supplements the job order, Fig. 1, and it, too, is made out with an original and three duplicates, going to office, shop, stockroom and accountant respectively. All these forms are of different colors—white, heliotrope, pink and yellow. In making out this order the number of the original job to which this form is supplementary and the owner's name and the number of his car are entered on the form. The owner or his agent signs the order (all four copies) and action is then taken as quickly as possible to carry out the supplementary order.

3. Working Tag.—When the car is sent into the shop a tag is attached to it. Fig. 5 shows this form in blank. It is printed black on white, thin cardboard of 4 by 7 inches, and on it the owner's name, the car and job number, as well as the date, are entered. On the reverse side there are spaces for enumerating the repair items to be carried out and spaces for checking the items when the work has been done. This tag is attached by means of thin wire to the steering wheel of the car and is not taken off until the repair job is finished and the car is ready to be re-delivered to its owner. As Fig. 5 shows, the tag is numbered; all tags form a series and each of them must be accounted for.

4. Operation Time Card.—In the shop it is of course necessary to keep track of the time spent by the various men on the various jobs in order to make correct charging possible. For this purpose the operation time card, Fig. 4 is used. This is a form 3.375 by 7 inches, printed black on red cardboard. The front side is seen in Fig. 4; it affords space for entering the name and number of the workman, the job number and the number of the account, as well as the car number and the name of the car owner. The rest of the card is designed much in the same fashion as the card for time clocks, so that the form, Fig. 4, may be used for recording time by means of such a clock. If a man spends a whole day and overtime on a job, he must stamp in and out, three times each, during 1 day. The first line is used on the first or sixteenth of the month, the second line on the second or seventeenth, and so on. There is a last column for totaling the time spent working every day, and the total time spent on one repair operation is noted at the foot of the blank, together with the wage rate of the man and the total wages earned by doing the job, or rather, the working operation. For, as indicated by the reverse side of the blank—not shown here—the card is used for only **one operation or item of a repair job.** On the reverse side the number and name of the employee are entered and the specific operation on which he is busy is named. Also, if the man requires material from the stockroom for doing his work, the number of the requisition used for this purpose is written on the card. Of course, this card is not the only means for checking the time of a man in the shop, but it merely serves as a time-distribution record and the total of a man's weekly operation card must check against his ordinary weekly clock card.



INSPECTION REPORT

CHASSIS NO. Inspector Date
Owner
Address
Distributor. Speedometer Reading
General Condition of motor mechanically

Brand of oil used
Condition of chassis mechanically

Condition of body & Equipment Type Make
Care taken of car

Chauffeur B or B
Ability Attitude toward car
Has Instruction Book?
Owner's opinion of car

Owner's attitude toward distributor

Owner's attitude toward the Company

Remarks:

Mr. has inspected the above car

Owner Chauffeur

Fig. 3—Inspection report used by the three Stearns inspectors, who regularly, about once in from 2 to 3 weeks, look over each of the 400 Stearns cars operating in New York. All inspection reports are filed under the names of the owners, to whose automobiles they refer. In this manner it is easily possible to trace, at any time, the development of trouble in a car, and to show to the owner, if necessary, that a possibility to overcome growing misadjustment, etc., could have been overcome in the past if prompt action had been taken

FORM 78 J. T. No. 1163

WORKMAN'S NO.
JOB NO. ACCT. NO.
WORKMAN'S NAME
CAR OWNER
CAR NO.

DATE	MORNING		AFTERNOON		OVERTIME		TOTAL
	IN	OUT	IN	OUT	IN	OUT	
1-16							
2-17							
3-18							
4-19							
5-20							
6-21							
7-22							
8-23							
9-24							
10-25							
11-26							
12-27							
13-28							
14-29							
15-30							
31							

TOTAL TIME HRS.
RATE
TOTAL WAGES $

Fig. 4—Working operation card filled out by each workman when carrying out a repair operation on a car. The time spent on only a single operation is accounted for on this card

5. Material Requisition.—When a man working on a car requires a part for the repair work he goes to his foreman with his operation time card, and the foreman on the reverse side puts down the name and quantity of the part required. The man then goes to the stockroom clerk or foreman, and the latter makes out the requisition, Fig. 7, which is 7.25 by 4.25 inches. The original of this form remains in the stockroom, a copy is forwarded to the superintendent's office and a triplicate to the accountant. The requisition gives the quantity and nature of the material drawn from stock and details about the job for which it is required. The accountant later on enters the list and net price on the requisition and this information is transferred to the superintendent's copy of the requisition for future reference.

6. Purchasing Order.—When materials are required to replenish the stock of the service department or to supply parts, etc., not on hand in the stockroom but needed to carry out a repair, the purchasing department is notified by the stockroom foreman and thereupon a purchasing order, Fig. 6, is filled out. This order is a blank, 10.5 by 7.25 inches, made out with two duplicates in different colors. The purchasing order, when being filled out, is addressed to the dealer who is to furnish the material, and a note is made of the stockroom requisition number, to which the purchasing order has reference. The white original of the order is sent to the dealer, the blue duplicate to the accounting department and the yellow triplicate remains in the purchasing department for reference. Space is provided for exactly stating the nature and quantity of the material required, and the terms of delivery and payment are printed on the form. When the material is received the shipping department—which also acts as receiving department—checks the goods against the invoice accompanying them, and then forwards the latter to the purchasing department for checking against the purchasing order. This being done, and everything being straight, the invoice is forwarded to the accounting department for repeated checking and settlement.

7. Return-Goods Order.—It may happen that specific repair jobs are sent out of the service departments into special shops. This applies to windshields and other parts, in the cases of which the repairing facilities of the service department shops are inadequate to make a good or economical job. If, say, one pane of a windshield is to be replaced and the shield is sent out, a purchase order is made out for a pane and a return-goods order, which is attached to the shield, is sent with it. The job having been completed, the goods are sent back to the Stearns place, and the instructions given on the form, Fig. 8, are checked against the invoice to see whether they have been properly carried out. After this has been done, purchase, return-goods order and invoice are turned over to the accounting department like the data referring to an ordinary purchase.

8. Daily Time Report.—The Stearns company uses a specially-designed blank,

Date_____19

Job No.

Owner

Car No.

Do Not

DETACH

THE F B. STEARNS CO. of New York

SERVICE DEPARTMENT

Tag No 1 997

Fig. 5—Working tag used in the Stearns service department for outlining the work to be done on a car which is sent into the shop. This tag is securely attached to the automobile as soon as it is received by the superintendent of the department. The tag is fixed to the steering wheel and must not be removed therefrom before all repairs have been finished and the car has left the shop ready to be turned over to its owner, whose name appears on the tag. The reverse side of the tag enumerates the various items of repair work to be carried out and there are spaces for checking these items, so as to prevent the shop men from overlooking necessary work which was ordered by the owner when bringing the car into the service department. This record tag positively prevents errors on the part of the shop workers and also loss of time which would arise if the men would have to go to the foreman or his assistant for instruction as work is progressing on a job

STORES REQUISITION No. 1290 DATE_____

Issued by Car No. Acct. No. Job No.

CK.	Quantity	Pat. or Item No.	DESCRIPTION	Unit Price	LIST	NET

Received by_____ Total Cost_____

Fig. 7—Stockroom requisition used at the service department

Fig. 10, to check its total labor expense against the distribution among the employees. This form is 4 by 13 inches, printed black on white paper and is filled out on a typewriter. On the first line the date of the day is entered and the remainder of the page is divided into two sections, the first having five columns and the second two. The first section is used for recording the time spent by the various shop workers on the various jobs, and the second for giving the total time each man worked on that day. In the first section each job which is worked upon in the shop is taken up. The job number, the car owner's name, number of the employees who worked on the job during the day and the time spent on the job by each of them are given, as is the total number of hours spent in the shop on that particular job until the evening of the day for which the report is made out. In the same way, paint labor, general work around the building (non-productive, so called) and what small productive work is occasionally done, are recorded. The total time spent by workers on that day is thus found—being compiled from the operation cards. In the second section of the report the total hours spent in the department by every man are copied from the weekly time-clock cards and the total must be equal to that of the time-disribution column. It is stated that as a rule, the total time given by the clock cards and that accounted for by operation cards coincide within a margin of 2 per cent.

9. **Job-Cost Record.**—This form, Fig. 2, is printed on the reverse side of the accountant's copy of Fig. 1, on a sheet 18 inches deep, to afford plenty of space for all labor and material expense items on a job. As Fig. 2 indicates, the cost-record side of the accountant's job order copy is so ruled as to permit of entering the following points of information: Requisition number, number of parts or quantity of material required and the pattern number; then follows the name of the part and the unit list price, the total list and net prices, charges for outside work and the price of materials used in the paint shop. Under distribution the accountant makes a note of whether the paint job—if such has been done—is to be charged at a flat rate arranged for when the car is taken to the service department, or whether the various materials are itemized on the bill. The date on which the parts have been replaced or the repair made, together with the time spent on the job; the total cost of repair and paint labor to the company and the special accounts—if charges are made to such—are also noted. There are some cases, when work is done without charge to the customer, and the work must then be charged to one of the many accounts provided for such purpose: guarantee, repair, etc. Miscellaneous is a column that is hardly ever used, as the others cover almost all possibilities of charges. The amounts billed are also given.

S O NUMBER

REQ. NUMBER

PURCHASING DEPARTMENT

THE F. B. STEARNS COMPANY, OF N. Y.

BROADWAY AT 57TH ST.

NEW YORK CITY

ORDER NUMBER 1281

THIS ORDER NUMBER MUST APPEAR ON YOUR INVOICE

To

SEND ALL GOODS TO 415-417 WEST 55TH ST.

SHIP VIA WHEN

KINDLY ENTER OUR ORDER AS FOLLOWS:

ITEM	QUANTITY	DESCRIPTION	PRICE

DELIVERY F. O. B.
TERMS: 2% 10th Proximo.—60 days net.
No charges allowed for Boxing, Crating or Cartage.
The filing of any part of this order is acceptance of all terms and conditions.

THE F. B. STEARNS COMPANY OF N. Y.

PURCHASING AGENT.

Fig. 6—Purchasing order used by the Stearns service department for ordering stock supplies

1-13-1M-12936-M-H

The F. B. Stearns Co. of New York **No. 1147**

RETURNED MATERIAL Invoice No.

TO BE PACKED WITH GOODS

Shipped to — Date

Address — Repair Order No.

Via — Purchase Order No.

QUANTITY	YEAR	DESCRIPTION

Claims for errors will not be entertained unless made within ten days from receipt of goods.

Fig. 8—Return-goods order used when outside repairs are made

As mentioned before, the weekly clock card must very closely coincide with the daily time reports, and the workmen, knowing this, make very exact records in ringing their working times on the operation cards. Of course, the various men are paid at different rates and on different bases, but the time spent on service jobs is charged to customers at a fixed rate.

Practically the only man specially required by this system is the time-keeper who compares weekly and operation time records and makes out the daily reports. The men of course know that exact records work out to mutual advantage and that they are getting a square deal when they exactly account for their time spent in the department.

It stands to reason that the use of such a blank as the daily time report greatly facilitates the economical conduction of the service department. The reason is that while parts and materials are bought at a certain price and sold at a certain price—so that there is almost no chance for loss here and a possibility of a small gain which may serve to pay part of the service expense—it is only by full utilization of the time of all the laborers employed that it is possible to conduct a service department without loss or even with a small profit. It is by this economy that a company is enabled to give its customers the best possible service for a minimum of expense to them. It is due to this consideration that service systems are becoming more and more common with the branches of most large automobile manufacturers.

Coming back to the original subject of passenger car inspection and the single example here quoted, it is important to recognize than an inspection scheme of this nature benefits the car maker fully as much as the user. The principal advantage, of course, goes to the latter, inasmuch as the careful inspections, combined with report letters to the owner, help the latter in reducing the repair expense of his car. Incidentally, such work as carbureter adjustments made by the inspectors go to minimize the fuel bill, so that an all-around profit arises to the owner. But here the maker's advantage comes in. The owner who perhaps had one or two cars before that, the makers of which give inspection service, sees that this institution makes for cheaper car maintenance and consequently is most apt to buy his next car from the same company; and what is more, when advising friends and other prospective purchasers, will influence them, and in many cases finally, to buy the car with which the best service goes. As a matter of fact, passenger-car inspection at this state of the game has distinct advertising value to the maker introducing it. Its cost is comparatively negligible and the advantage immense. This is one of the principal arguments in favor of passenger-car inspection, if not the very largest, and on its strength it is safe to predict that 2 years hence the car inspection will be as common as the service building itself.

JOB SUPPLEMENT

No. 1027

Date

Customer

Job No. Car No.

COST COPY

Please add instructions as follows:-

I hereby authorize to perform the repairs as noted above

Owner

Agent

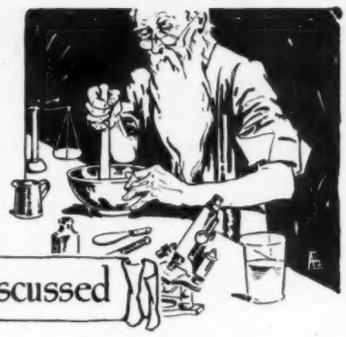
Fig. 9—Job-supplement order for additional instructions

THE F. B. STEARNS CO. OF NEW YORK
SERVICE DEPARTMENT
DAILY REPORT
Date 4/3/13

Job No.	Owner	Roll No.	Hrs.	Total	Roll No.	Daily Hours
4263	Jones	201	3		201	9
		205	4¼		203	9
		210	2	9½	204	9
2133	Smith	214	7		205	10½
		210	2		206	9
		206	3½	12½	207	9
					208	9
4432	Thompson	211	2½	8½	210	8½
		207	6		211	9
3382	Camp	201	6	6	212	9
					213	9
4111	Williams	203	9		214	9
		204	9			109
		205	4½			
		206	5½			
		207	3	31		
			71½			
Paint Labor						
5666	Wharton	208	9			
		212	9			
		213	9	27		
			27			
Non Productive Labor						
Shop Clean			6			
Janitor			4½			
			10½			
Summary						
Productive			71½			
Repair Jobs			27			
Paint "			10½			
Non Productive			109			109
No men employed						12
" Jobs in operation						6

Fig. 10—Daily time report

The Rostrum



In which Letters from Readers are Answered and Discussed

How To Adjust the Winton-Stromberg Carbureter—Correct Steering —Explanation of the Pressure System of Fuel Feed—Schebler Curves— The Way to Quebec—Adjustment of the Overland Planetary Gear

Maximum Weight Carried by Car

EDITOR THE AUTOMOBILE:—Will you kindly let me know the maximum weight that can safely be carried in a model T Ford car?

Easton, Pa. WILLIAM S.

—In designing this car, the Ford company allowed for a weight of 750 pounds. The car could probably carry double this weight if the owner wanted to take risks of wearing out the tires and drive parts at an exceedingly rapid rate. For ordinary running about the weight of 750 pounds should not be exceeded. The average weight of a person is generally taken in engineering practice to be 150 pounds. Thus in the five-passenger car, five passengers would give a weight of 750 pounds. As 150 pounds is above the average weight of a human being, and since the car is often run with from one to four passengers, the excess allowance readily takes in the baggage that may be carried. Should five heavy men get into the car, however, the total weight would not impose any noticeable strain because the car is designed with sufficient margin of safety to take care of any loads of this nature which may occur from time to time. The maximum weight that could be carried before the frames or any other members of the car suffered permanent distortion is impossible to state and doubtless would even vary with different Ford T cars, since the elastic limits of two pieces of metal are never the same.

Theory of Correct Steering

Editor THE AUTOMOBILE:—What is the correct method of designing a steering gear? Do the front wheels swing about in concentric circles or not? What is the relation of the movement of the rear wheels in relation to the front wheels in turning a curve?

Detroit, Mich. DRAFTSMAN.

—This is well explained in an English book *"Petrol Motors and Motor Cars,"* by T. H. White, which states that the steering gear of the present-day automobile is identical with that patented by Ackerman in the eighteenth century for use on horse-drawn vehicles. Unfortunately, the original intentions of the inventor are too often overlooked by motor car designers, with the result that undue wear is imposed on the steering wheel tires as well as strain to the wheels themselves. When correctly designed and constructed, the Ackerman gear allows all four wheels of the car to move with a purely rolling motion without any tendency to a lateral, or scraping movement. With incorrectly-designed gear, the relative angles of the steering-wheels will not correspond to the direction in which the car is traveling (unless this be in a straight line), consequently, one, or perhaps both, steering-wheels will scrape the road more or less to the detriment of the tires. A further evil is that the sensitiveness of the steering is impaired and side-slip encouraged or even initiated.

To illustrate the difference between correctly and incorrectly designed gear, the diagrams, Figs. 1 and 2, are presented These are purposely exaggerated to make the principle more clear. In Fig. 1 we have the steering arms, A and B, at right angles to the axles upon which the wheels revolve. So long as the car is traveling in a straight line, the front and back wheels will be parallel, and all four will have a rolling motion only. Let us see what happens when it is required to turn a corner. The dotted lines in Fig. 1 show the new positions of the steering-wheels and gear. The arms, A and B, will remain parallel, being coupled together by a rigid connecting link, hence each of the steering wheels is deflected through the same number of degrees. We will assume the vehicle to be traveling along a curved path struck from the center O. If the axes of the steering wheels are produced to intersect the axis of the driving wheels (also produced), as in Fig. 2, we shall obtain the points O and X. To have a purely rolling motion the steering wheels should run along curves struck from O and X as centers. It is obvious that this is not possible, and probably the outer wheel will follow the arc RR struck from center O, whereas its natural path would be along SS, struck from X. The difference between these two paths will be made up by the type sliding laterally on the road.

From this it will be seen that the outer wheel should be deflected through a smaller angle than the inner one, and this is accomplished by setting the steering arms inwards, as A and B, Fig. 1. We now find that the produced axes of the steering

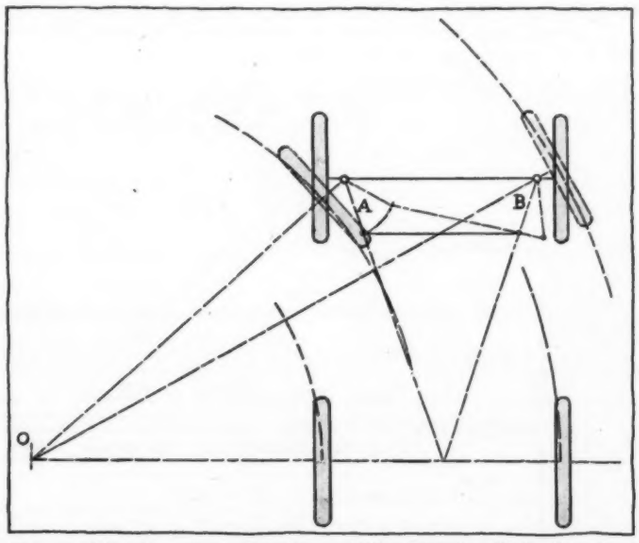


Fig. 1—Showing the concentric circles about which the four wheels of a car swing with a correctly-designed steering gear

wheels both intersect the produced axis of the back axle at the same point O, hence the wheels of the car will have a purely rolling motion.

It is to be regretted that there is no formula for obtaining the correct angle for the steering-arms; a process of trial and error is the only solution. The angle will vary with the distance between the front and back axles, and with the distance from center to center of the steering pivots. It is also slightly affected by the distance from centers of steering wheels to the centers of their respective pivots. The gear cannot be made correct for all inclinations of the steering wheels, but if made right for the extreme inclination it will be sufficiently correct for all practical purposes at all angles. This extreme position will be determined by the radius of the smallest circle the car has to travel around, or by the limitations imposed by the design of the frame of the vehicle. The present practice of giving a long wheelbase to a car tends to reduce the angle of lock of the steering wheels even when the frame of the vehicle is made narrow to give clearance for the wheels.

The method of designing the steering gear is as follows: The center lines of the two axles are first drawn in their correct relative positions, and to as large a scale as convenient; generally quarter size. The centers of the steering pivots are then marked, and the bare outline of the two steering wheels drawn in. The frame of the car, so far as it is likely to interfere with the wheels, is also indicated. The centers of the steering pivots should be as close to the wheels as possible, as this tends to re-

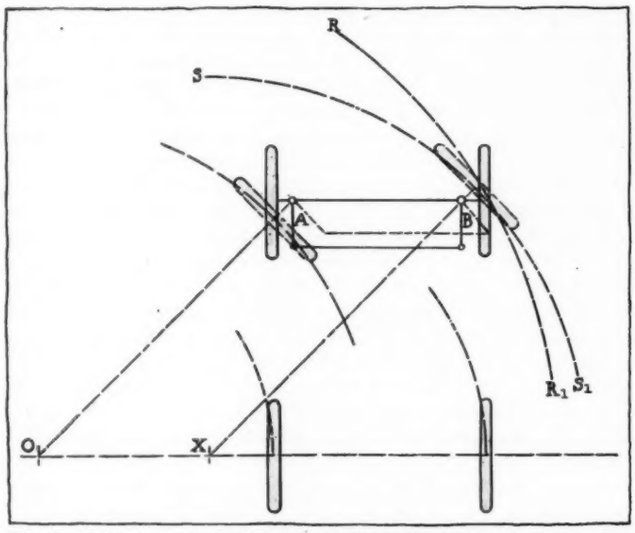


Fig. 2—With an incorrectly-designed gear, the circles through which the wheels swing when turning are not concentric

duce the strains on the steering gear. Strike an arc from each steering pivot center with a radius equal to the effective length of the steering arm. Draw the wheel on the inner side of the curve in the position of extreme lock, and produce the center line of its spindle to intersect the produced center line of the back axle. From this point draw a line through the steering pivot center of the other wheel. This will give an angle through which the outer wheel must be deflected. The two wheels are now traced on small pieces of tracing paper, which are pinned to the drawing board in such a maner as to allow them to be turned about the steering pivots in the same way as the wheels would be in actual practice. Assume a position for the extremities of the steering arms, and with the dividers see if the distance from arm to arm is the same with the wheels parallel, and when they are inclined to their extreme positions as obtained above. If not, the steering arm angles must be modified until this condition is fulfilled. It need hardly be mentioned that each steering arm should be inclined at the same angle. The gear need only be made correct for one direction of inclination; it will then be right for both.

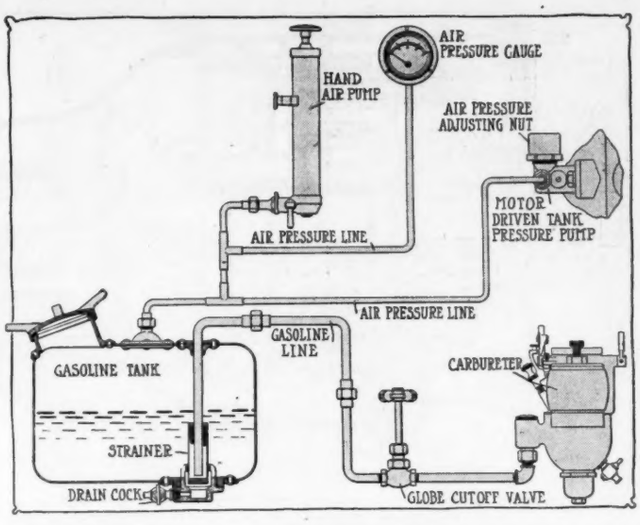


Fig. 3—Diagram of the pressure gasoline feed system used on the National 40, which is typical of practice in this direction

The practice of many designers is to so incline the steering arms that their center lines, if produced, would meet at a point at the center of the back axle. This will only give a correct steering gear when all the conditions of wheelbase, gauge, or track of wheels, centers of pivots, etc., are suitable. It is recommended that the gear be set out for each different size and type of car. Whether the steering arms project in front of or behind the axle depends on the fancy of the designer for the most part; the principles remain the same. If they project forwardly, they will diverge to the same angle as rear arms would converge.

Many designers hold the opinion that forwardly projecting steering arms are preferable, in that the connecting link is then subjected mostly to tensile stress. Rearwardly-projecting arms are held to cause the stress on the link to be mainly compression. In point of fact, the stresses caused in the link are both tensile and compressive, whether they project in a forward or backward direction. The forward arms have the disadvantage that they cannot always be made to diverge far enough to obtain the correct angle, without coming in contact with the spokes of the wheels. With the arms arranged behind the axle there are no such restrictions. In designing the gear, it is well to remember that long steering arms tend to reduce the stresses on the connecting link and its joints. The practice of curving the link connecting the steering arms cannot be too strongly condemned; it should always be straight.

Adjusting Carbureter on Winton

Editor THE AUTOMOBILE:—I have a six-cylinder Winton car, Model 16C. The carbureter on this car is a specially made Stromberg, known as the Winton-Stromberg, I understand. This has not been functioning as it should of late. Please tell me how to adjust it.

Buffalo, N. Y. READER.

—1—The Winton-Stromberg carbureter is illustrated in Fig. 6. As may be noted there are two gasoline jets. The main jet H, is located in the main venturi passage and forms the ordinary method of spraying the fuel at low speeds. At higher speed an auxiliary jet Z comes into play. As will be seen, this second jet is located close to the auxiliary air valve passage. To adjust the carbureter, turn the lock nut N till the auxiliary air valve seats lightly. This may be determined by pressing the finger down upon the valve through the opening above it. When the valve just seats, turn the nut from two to five notches further up for additional tension. See that the nut M, at the top of the auxiliary clears the secondary nozzle lever P. There must be more than 1-64 inch of a space between the two and it will usually be found that between this figure and 1-32 inch clearance will exist when the auxiliary valve is correctly ad-

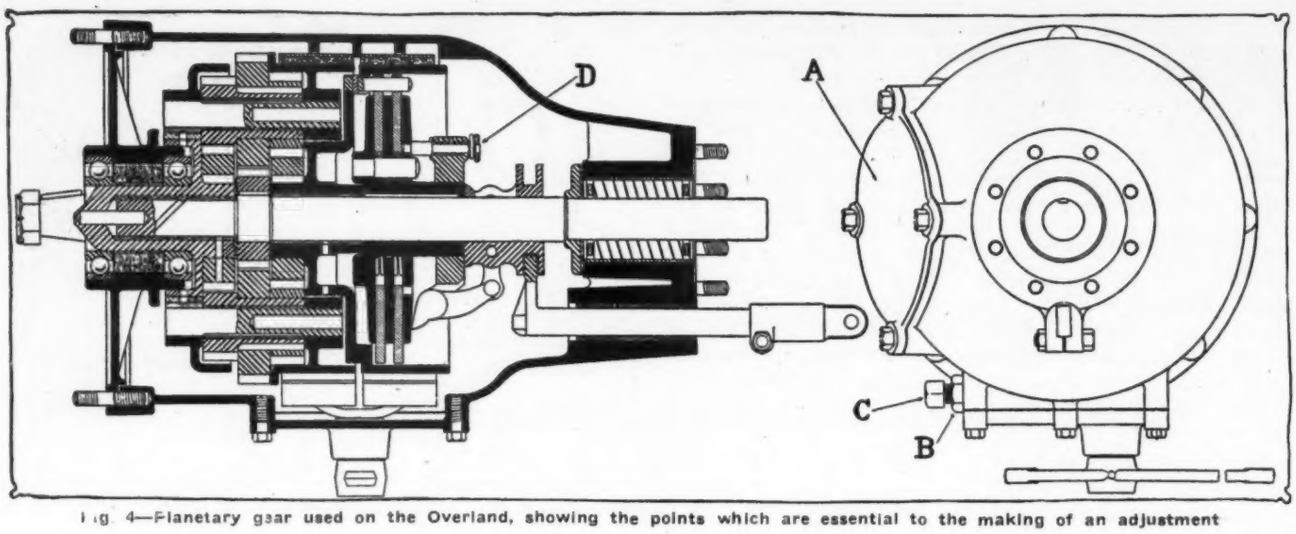


Fig. 4—Planetary gear used on the Overland, showing the points which are essential to the making of an adjustment

justed. Turn the adjustable nozzle stem G, to the right as far as it will go without trying to force it when resistance is felt. This will seek the adjustable needle valve H. The stem G, is then turned back from one-quarter to three-eighths of a turn. Now start the motor and turn G, to the left or right until the motor idles properly. Advance the spark and open the throttle wide and if the motor backfires, move down the adjustable nut M, on top of the auxiliary air valve stem. This makes the mixture richer at high speeds. If the motor smokes and the mixture is too rich, move the adjustable nut M up. It would be a good plan to move this nut M up until the motor backfires and then move the nut down until the motor runs smoothly without backfiring.

The gasoline lever in this carbureter is adjusted by the lock nut L on the top of the float chamber. Turning the nut down lowers the level and turning it up raises it. This nut rarely if ever requires attention as the gasoline level is correctly set at the factory. An easy starting device is placed on this carbureter. The valve A shuts off the air supply and allows all the suction to fall on the jet H. In very cold weather the priming attachment on the top of the float chamber may be used. When the motor starts the starting valve A is immediately opened, allowing a free air passage.

Pressure Gasoline System Explained

Editor THE AUTOMOBILE:—Please give me some idea as to the proper layout of a pressure gasoline system, showing proper piping and relationship of gauges, valves, etc.

New York City. SUBSCRIBER.

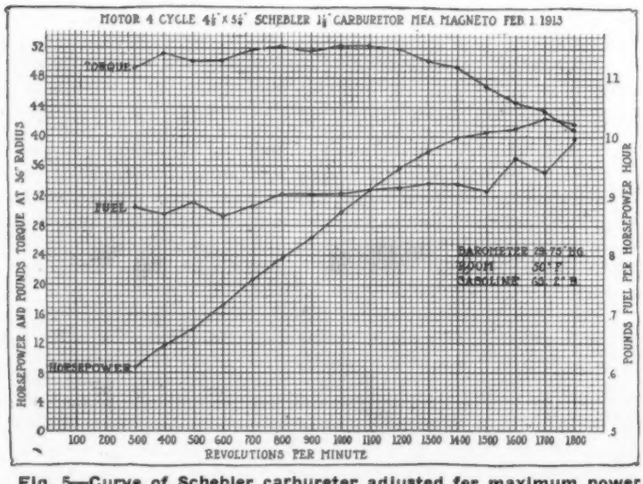


Fig. 5—Curve of Schebler carbureter adjusted for maximum power delivery

—The pressure gasoline is best explained by taking a concrete example. Fig. 3 shows that employed on the model 40 National cars. This is a very complete layout and is typical of practice in this direction. Directly driven from the camshaft or any other moving part of the motor there is a small pressure pump which is so regulated as to produce under moderate speeds a pressure of about 2 pounds in the air line. The air pressure line pipe indicated in the illustration is led directly to the tank. From the air pressure line a pipe leads to the air pressure gauge which shows the pressure in the line of which the gasoline pressure tank is a part, and pounds above atmospheric. It is a law of nature that the pressure at any point in a receiver holding a gas is the same. Therefore the pressure in the tank and piping is the same and the reading on the gauge will be correct and express the pressure in the gasoline tank. It is evident that if the car has been standing some time the pressure will have leaked from the tank in various ways and it is necessary, in order to get the gasoline to flow if the car is standing uphill, to force pressure into the tank by some outside means. The outside means provided on the National car is a hand air pump which is indicated in the illustrations. A few strokes on this pump puts sufficient pressure into the tank to secure a flow of gasoline to the carbureter and start the motor. After this of course the pressure is maintained automatically by the motor-driven tank pressure pumps. The pipe to the carbureter issues from the strainer at the bottom of the tank and carries the gasoline to the flow chamber. Between the tank and the carbureter a cut-off valve is inserted for shutting off the gasoline when removing the carbureter or draining it.

Interested in Trip to Quebec

Editor THE AUTOMOBILE:—1—If I desire to go to Quebec, Canada, say from Bilton Woods, is it possible to go to Newport, Vt., and start from there?

2—If so, can I reach Quebec in 1 day from Newport in comfort?

3—If not, can good accommodation be secured?

4—How are the roads?

5—Is there a better starting point than Newport, Vt.?

Boston, Mass. THOMAS PERKINS.

—1—It is entirely practical to start this trip from Newport, Vt., and, in fact, this is the best way of doing it. The distance from Newport, Vt., to Quebec is 178 miles. Leaving Main street, Newport, and traveling east you pass through West Derby and then at 5 miles on the odometer reach Derby. Turning left into this village and following the main road north you pass across the international boundary into Stanstead, Can. It is at this point that the customs bond must be secured. This is based on the value of the car, as appraised by the customs officials. A

fee of $5 is required for the machine and $5 for the chauffeur. The customs bond is returned upon leaving the country.

Passing straight through Stanstead on the main road, you come to Caseville at 17 miles out from Newport. The road becomes hilly at this point with some beautiful views of lakes and mountains. At 32.3 miles there is a fork in the road at which you should keep to the right passing right through a covered bridge and into Lennoxville. Beyond Lennoxville there is another covered bridge and at 40.8 miles there is a fork at which you will have to keep to the left. At 41.6 take the left hand road and keep to the left for the next three forks. At 48.1 you cross a bridge keeping to the right of a saw-mill. Another bridge is located at 51.6 and a fork at 52.8 at which it is necessary to keep to the left. You now pick up a line of telegraph poles which carries you through Ascot village, South Dudswell, Marbleton, Weedon, and taking the branch road to the right at 85.0, into Garthby and 5 miles beyond at a reading of 91.6 on the odometer into D'Israeli. At this point your gasoline tank may be refilled.

Again taking up the journey, leaving D'Israeli by taking Main street along the railroad track and passing out through Colraine Station along the shore of Lac Noir over a stony winding road and then at 103 miles, taking right hand road up hill turning square left at 103.2 and bearing to the left at the fork just beyond. Gasoline may be secured at the offices of the Beaver Asbestos Co. Thetford Mines is then entered at 108.1 and following railroad tracks you come to Robertson Station, turning left to Reedham and keeping left to Kinear's Mills, Leeds village, St. Sylvester and Parkhurst. Keep straight ahead on good gravel road through St. Giles, following poles along Beaurivage river through Chaudiere, turning right at end of road at 166.7 and then left on good dirt road. Turn right on the river road, passing under the railroad at 170 miles and across the iron bridge beyond. Follow tracks to Levis-Quebec Ferry and after crossing ferry turn right and then left of steep hill direct into Quebec.

2—This largely depends on your car. If you have a high-powered car with comfortable suspension you may make a 1-day trip of this, but it would be far more comfortable to break it into two trips, stopping for the night at Thetford Mines.

3—Accommodations are largely a matter of taking the best thing available, but you can probably secure good accommodations at the place mentioned.

4—The roads are of dirt and on the whole not so bad if the weather has been good. There are no heavy grades.

5—Newport, Vt., is the best starting point. A full description of this route is given in Volume II of *The Automobile Blue Book*.

Adjusting Overland Planetary Gear

Editor THE AUTOMOBILE:—I have an Overland car using a planetary transmission. It does not seem to work right and needs adjusting. Will you please tell me how to go about it.

White Plains, N. Y. SUBURBANITE.

—Remove the cover A, Fig. 4. This will expose the clamping bolt on the spider and you may see if it is loose. By pulling out the pin D it is possible to turn the spider and this may be turned to the right until it is tight. It is not desired that the adjustment here be too tight and experience alone will enable you to tell the correct tightness. A moderate degree of tightness will give you an approximate idea as to about what is required. After you have made this adjustment the clamping screw should be tightened. This is visible through the opening and cannot be mistaken. If it is not possible to reach the clamping screw with the cover A off, open the compression box on the cylinders and have someone turn the motor over slowly while you watch the spider until the screw comes where you want it. To adjust the reverse loosen the lock nut B and turn the set screw C to the right till the desired adjustment is attained; then tighten up the lock nut again. The low speed is adjusted in the same manner as the reverse except that the rear set screw is used. Be sure to tighten the locknuts sufficiently in order that the adjustment will be permanent.

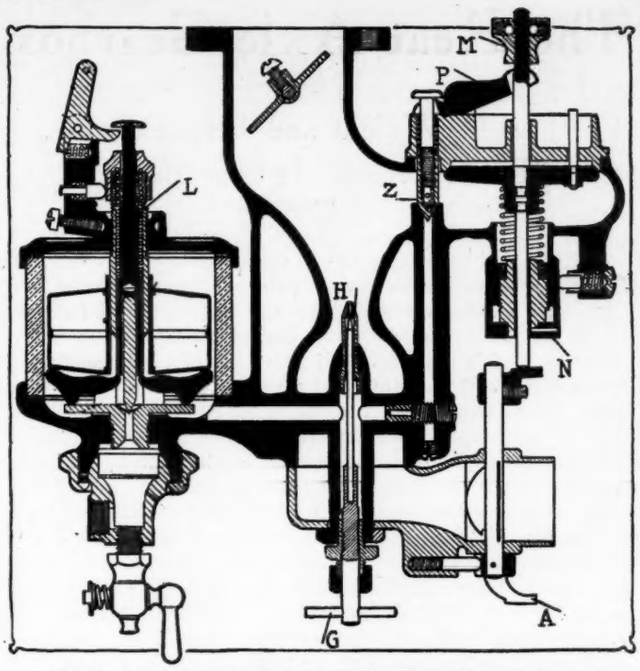


Fig. 6—Section through the Winton-Stromberg carbureter

Schebler Carbureter Curves

Editor THE AUTOMOBILE:—Would you kindly explain the difference between a carbureter adjusted for maximum power or maximum economy?

Kindly show this on a Schebler carbureter if possible.

Newark, N. J. CARBURETER.

—The difference between the two adjustments is better shown by curves than by a descriptive explanation. Figs. 5 and 7 give the results obtained with the same carbureter, one adjusted for maximum power and the other for maximum economy. The one adjusted for maximum economy as will be seen from the curve uses for instance .6 pound fuel per hour at 1,400 revolutions per minute, while that adjusted for maximum power uses .9 pound of fuel per hour. The maximum horsepower attained with the fuel adjusted for economy, 1,600 revolutions per minute, is 34.5. With the carbureter adjusted for maximum power about 41 horsepower is attained at this speed.

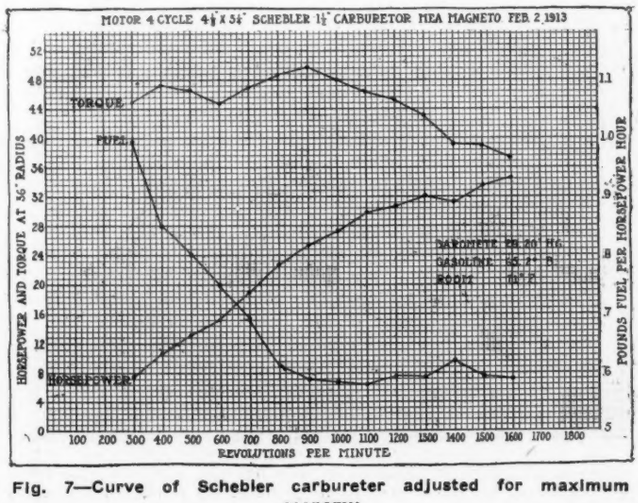

MOTOR 4 CYCLE 4½ X 5½" SCHEBLER 1½" CARBURETOR MEA MAGNETO FEB 2 1913
TORQUE
FUEL
HORSEPOWER
HORSEPOWER AND TORQUE AT 36" RADIUS
POUNDS FUEL PER HORSEPOWER HOUR
REVOLUTIONS PER MINUTE
100 200 300 400 500 600 700 800 900 1000 1100 1200 1300 1400 1500 1600 1700 1800

Fig. 7—Curve of Schebler carbureter adjusted for maximum economy

The Rear Axle Gearbox

Light Weight and Efficiency Two Reasons In Its Favor

By S. E. Waldon, Vice-President
Packard Motor Car Company.

THE present Packard rear axle gearbox was conceived and first built to be a part of the Gray Wolf racer in 1902 at a time when we desired to—and finally did—equal the world's mile-record of 46 2-5 seconds, with an engine having a bore and stroke of 4 and 5 inches, respectively.

We wanted the lightest, simplest, most efficient and most dependable method of delivering every ounce of power developed by the engine to the rear wheels. The combination of the gearset with the bevel gearset in the rear axle accomplished all this.

When, in 1904, we departed from the up-to-that-time American practice of a single-cylinder engine under the body and adopted the so-called French practice of a four-cylinder engine under the hood, we unhesitatingly included the Gray Wolf gearset as being the most desirable for American conditions. We had previously built four-cylinder cars with sub-frame and four-speed gearset under the body, and consequently knew both sides of the question when our decision was reached.

The logic of carrying the gearset on the rear axle applies with equal force to cars with six-cylinder motors.

The use of specially-designed machines and appliances enables us to manufacture the housing containing the differential and gearset with great accuracy. The alignment remains absolutely unchanged, and from actual figures obtained from the best cars of this country and Europe, our rear axle with its gearset combined weighs no more—and in many cases weighs less—than the rear axles in cars of similar power and capacity, which contain the differential and bevel gears only, and in which the gearbox is supported on the frame.

The front end assembly is assembled on the bench and then fitted to the gearcase, as shown in the illustration

The axles are placed in the rear axle housing, and when the front end assembly has been fitted to the gearbox the workman assembles the gearbox and rear axle units

Part of this saving in weight is in combining the two assemblies into a single compact unit and part is in the use of materials and design giving great strength with minimum weight. The design of our combination rear axle and gearset has, by reason of its lightness and strength, acquired for itself the characterization of bridge.

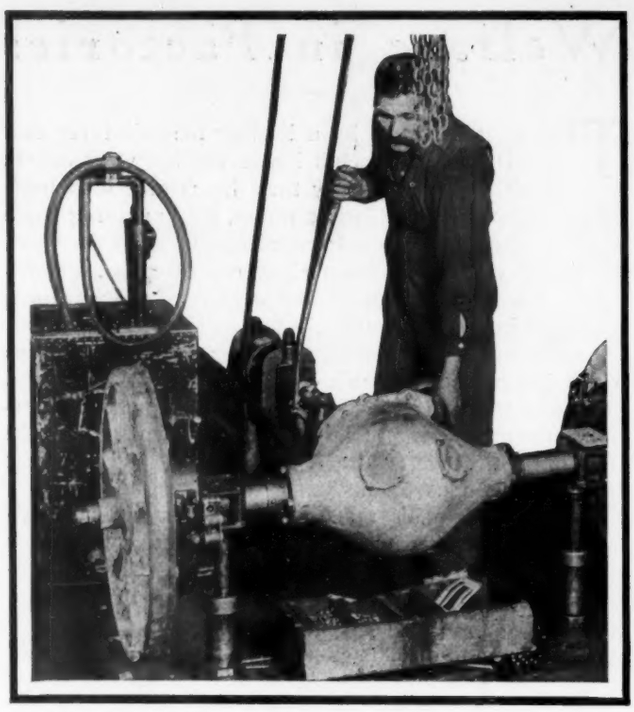
Single Universal on Shaft

Our chassis consists of two major units: One is the power plant forward and the other the transmission unit aft; both connected by a single universal joint shaft. The chassis may be warped and twisted over the most severe inequalities found in any kind of travel, with all the flexibility necessary contained in the one universal joint shaft. This shaft, on account of the fact that it has only to transmit the power of the motor, and not that power geared down for hill-climbing by a gearbox in the frame, can be made lighter and with ample bearing will last longer than if made the other way. Our construction necessitates only two universal joints, whereas the other requires four; that is, two in front of the gearbox and two between the gearbox and the rear axle.

The combination of the gearset with the rear axle leaves more room forward of it for a universal joint shaft. The longer this shaft, the less will be its angle of inclination and the less will be the wear on the joints.

The absence of a gearset from behind the motor makes the clutch more readily accessible and a front cover on the forward end of our gearbox makes all the gears readily removable through it in 20 minutes' time, and without disturbing the body or any other part of the car.

Six-cylinder construction increases the weight on the front axle, which not only brings greater stress on the axle and steering parts, but interferes to some extent with making turns at high speeds. Taking the weight of the gearset away from the front axle produces a better-balanced car.



After brakes and wheels have been attached, the completed bridge assembly is filled with oil and tested under belt

The combination of the gearbox with the rear axle in the Packard produces in the body practically one-third of the reaction from torque, on the low and intermediate speeds, that would be exerted with the gearbox forward. The total of power going into our rear axle unit is only the amount that the motor can develop. The reaction, therefore, from the propeller shaft trying to turn the driving pinion tending to rock the body over to the right, is only equal to the power of the motor.

In the case of a gearbox attached to the chassis instead of to the rear axle, the power of the motor is geared down on lower speeds, and the universal joint shaft back to the rear axle has a tendency approximately three times greater to rock the body to the right with consequent discomfort to the passengers whenever the clutch is jerkily used on these speeds.

No Heat Is Near To Thin the Oil

Gear noise can be reduced to some extent by proper consistency of the lubricating oil, but all lubricating oils get very much thinner with an increase in temperature and this tends to increase the gear noises. With the gearbox on the rear axle, there is no hot exhaust pipe, muffler or motor near it to thin down the lubricating oil. Therefore, if the proper oil is supplied in the first place it retains its consistency and insures uniformly quiet running of gears.

The gearbox being combined with the rear axle permits an insulating current of air to pass between it and the body of the car. The same gears and the same gear sound are about four times more noticeable and objectionable when up in the chassis, as compared with being on the rear axle. This explains to a large extent the greater absence of noise and the increased comfort to the person riding in an inclosed car of our construction.

Considering all the important features of simplicity dependability, lightness of construction, permanence of alignment, facility of manufacture and repair, greater accessibility of all working parts, lessened strain on the universal joint and lighter and longer universal joint shaft, freedom from torque reaction on low speeds, flexibility of the whole car, and the greater satisfaction when used in connection with inclosed bodies, has caused us to retain and perpetuate this construction because it was best and not simply because it was traditional.

Bennett Rear Gearbox

Gearing Situated Between Pinion and Differential

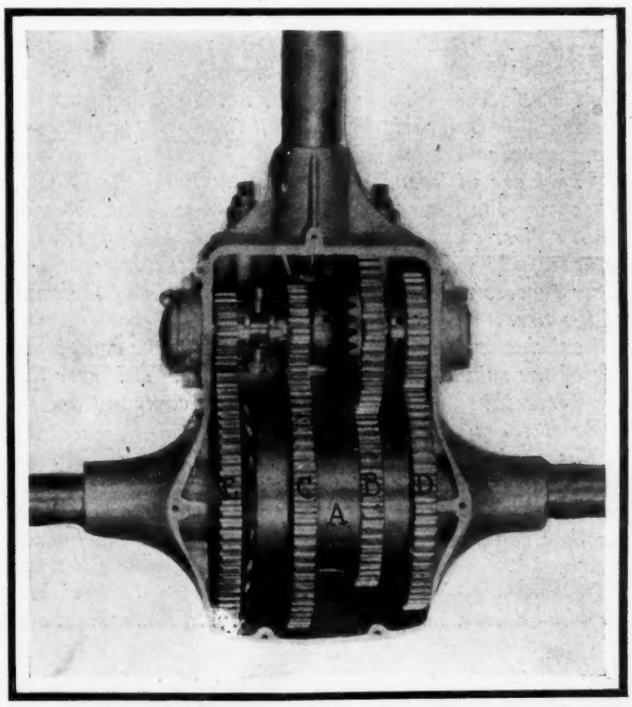
IN the ordinary type of change gearset, the various speed change gears are located forward of the driving pinion and its bevel gear. The latter is usually of the ring type and mounted on the rear axle shaft, carrying within it the differential gears.

S. S. Bennett, Highland Park, Mich., a suburb of Detroit, has invented a rear axle unit, which reverses the position of the pinion and bevel gear and places them forward of the change speed gears, thus causing the driving pinion to be always rotated at the same speed as that of the crankshaft of the motor.

In the illustration herewith a general idea of the Bennett construction is brought out. The change gears are always in mesh, any speed combination being obtained by the use of tooth clutches, the toothed parts of which slide on their shaft, while their mating members are integral with the change gears. To aid in the shifting of these clutches, the jaws are given a worm effect of .125 inch. The gears have six jaws each.

With the Bennett arrangement, the driven gears are all made larger in diameter than the driving gears, with the view of equalizing the strain between the driving pinion and its gear.

The differential gear is carried within the drum, which surrounds the rear axle, its approximate location being indicated by A in the illustration. It is claimed for this arrangement that since the gearset is back of the driving pinion and rotates one-third to one-quarter as fast, there is less shock to the mechanism. This speed difference is also said to render the gearing noiseless while running on the lower gears, as well as when changing speeds. The driven gears are all unhardened, which is a manufacturing consideration. Referring to the illustration, the direct drive gearing is shown at B; combination C gives low speed, while intermediate is obtained by D. Gears at E give the reverse through the use of a small pinion inter-connecting the two main gears and back of them.



Bennett rear axle gearbox, showing drive on differential drum

The Automobile

Vol. XXVIII Thursday, April 17, 1913 No. 16

THE CLASS JOURNAL COMPANY
H. M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
231-241 West 39th Street, New York City

BRANCH OFFICES
Chicago—910 South Michigan Avenue Detroit—505 Free Press Building
Boston—1035 Old South Building Cleveland—309 Park Building

EDITORIAL
David Beecroft, Directing Editor
Donald McLeod Lay J. Edward Schipper
Sydney Oxberry Hans W. Weysz
L. V. Spencer, Special Representative, Detroit

Francis L. Wurzburg, Advertising and General Manager

ADVERTISING
H. J. Garrison, New York C. H. Gurnett, Chicago
F. B. Barnett, Cleveland F. J. Robinson, Chicago
W. L. Chapman, Boston L. G. Vogel, Detroit
C. K. Brauns, Buffalo

Cable Address---------- Autoland, New York
Long Distance Telephone---------- 2046 Bryant, New York

SUBSCRIPTION RATES
United States and Mexico ---------- One Year, $3.00
Other Countries in Postal Union, including Canada ---------- One Year, 5.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903 and the Automobile Magazine (monthly), July, 1907.

Different Tire Prices

THE recent announced cut in tire prices made by one of the largest tire producers in the country, and which was soon followed by similar reductions by several other concerns, naturally suggests the thought, "Is it necessary to sell all tires of approximately the same size at the same price?"

¶ There are differences of quality in tires, the same as in cars of the same horsepower and passenger capacity. Each rubber company has its own secret processes which are carefully guarded by the respective factories, and on these processes naturally must depend much of the value of the tire.

¶ Each factory has its own percentages in the compounding of the rubber which goes into its tire. It is rare that the percentages in this work with one company are the same as those with another.

¶ The grade of fabric used in different tires of the same make varies. One concern uses a genuine Sea Island cotton which costs 62 cents per pound or thereabouts, and another concern uses an Egyptian fabric which may be purchased at 42 cents per pound, and in view of the fact that there are about 10 pounds of fabric in a tire there should be here sufficient reason why tires should be of different price.

¶ The sooner car owners realize that there are differences in the wearing qualities of tires, the better for the entire industry.

Welfare in Factories

THE announcement by a leading manufacturer that he is erecting a club house for his workmen in which they can enjoy their luncheons, hold business meetings, have athletic contests, enjoy reading room facilities at a very nominal annual fee, suggests the value in these days of acute labor situations of such measures in which the personal uplift and welfare of the workmen are taken into consideration.

For example: the workman belonging to a factory which has a workingman's club with its reading rooms, gymnasium, spray baths, base ball diamond, etc., generally puts more concentration into this work than the artisan in the factory which is without all of these humanitarian departments.

This workingman's uplift movement is not new, although the erection of workmen's club by a factory is new, and its results will be watched with particular interest. Employers of large numbers of workmen are beginning to realize that frequently there are other things as efficient in production as time. Two workmen paid on the same scale and working the same number of hours per day are of varying value to the employer. In one the activities are solely confined to the few hours of labor, and may be none too intelligently directed; whereas with the other working but the same number of hours a greater intelligence enters into the work from which the employer benefits directly. This suggests the necessity of getting the best effort out of the workman without any thought of introducing longer hours, or other sweatshop practices. It is true that the mind of the workman has a definite effect upon the job; and it is further true that the factory conditions play a big part in determining the mental condition of the workman so far as his relationship towards the work is concerned.

One of the largest German industries, and one which enjoys international repute, is conspicuous by its welfare arrangements, all of which are controlled by the workmen. These organizations have done much to improve the workman's conditions, and also his efficiency to himself and to the factory without expense to either party. Such a German organization, by voting that all workmen drink milk or buttermilk at the midday lunch instead of the native beer, showed the extent to which welfare organizations promoted entirely by the workmen can work towards benefiting his own conditions and also improving factory conditions.

A few of our automobile and accessory factories have done much to develop welfare work by way of organization among the various departments covering sick benefits, accidents, etc. The organization departments of other factories have discovered the value of opening noonday kitchens in the factories where unmarried help can secure at a nominal fee a satisfactory luncheon of wholesome food, and where married men who bring their luncheons can enjoy them in comfort at a table, and for a penny extra secure a cup of hot coffee or a glass of fresh milk.

Much more can be done in this workman's welfare movement, and those factories that are quickest to take it up in its various ramifications will discover in it a good investment.

The House Organ

Its Object—When Published—Made to the Hour

BUILDING up an *esprit de corps* and intensifying sales efforts should be one of the primary objects of the house organ, that local publication which the publishers frankly acknowledge is published "once a month when we can get it out" or "every once in awhile as occasions seem to demand."

While building up an *esprit de corps* among dealers and intensifying sales efforts are supposedly worthy objects of attainment yet it is a difficult task to discover just why certain makers publish these "every-once-in-awhile" organs. Look for a moment at what the makers themselves have to say: One maker says "the house organ we publish every once in awhile is in the interests of ——— owners and for the promotion of ——— motors." Another maker sums it up thus: "We publish a monthly house organ for distribution among our dealers and such of our owners as are interested in factory news." Another maker remarks "The circulation of our house organ is limited entirely to our dealers and in each issue we feature some particular dealer."

Another maker, of a more economic turn of mind and apparently with a desire for intensified effort, publishes two house organs—"one for the salesmen and one for dealers." With a maker who hopes for a general uplift of his owners and dealers we find the house organ "issued monthly and intended for circulation among ——— dealers and owners." And lastly, from a maker with an apparently unsystematic publication center comes the announcement that "This house organ has appeared at very indefinite periods, the last one having been published in July, 1912."

Judging from the policy of makers selling approximately the same commodity, as automobiles constitute the commodity referred to, it is quite impossible to determine just when house organs are published, whether monthly, semi-monthly, weekly or "every-once-in-awhile." Naturally, if house organs are to be of value, in brief, an investment to the company, they should at least have a regular time of issue, once a month, fortnightly or weekly. The intermittent, once-in-awhile type is of little value. It is so spasmodic that it never is taken seriously and it always fails in its purpose.

It is a debatable point whether in the best of regulated families a little once-in-awhile logic cannot be interjected to advantage. In seasons of greatest sales effort the house organ should come out at least once a week, even twice a week would not be an injury if made sufficiently brief and brim full of terse graphic paragraphs to aid in selling cars and meeting the exigencies of the moment. Once a week is not a bit too frequent in the busy season, and the maker who brings his organ out once a month the year round is missing much by his failure of intensifying effort at the busy season.

Sometimes intensified sales effort is carried to the extreme, to a point where sales effort is injured, where the capacity of the workman is injured by overwork. Such is the opposite to the desultory method, both of which are to be avoided.

What should the house organ contain? Not to be dictatorial, it would seem but logical that it should act as an asset to the selling organization, because, if what all of the makers publishing them say is correct, these little publications are to help the dealer, and incidentally go to the owner if he is interested in factory work.

Taking it then for granted that the dealer with his salesmen is the person to be aided then the house organ should be timed to the seasons and not published as a "tale that is told." The publisher then, must breathe the atmosphere of the manufacturer, of the sales organization and should reflect the atmosphere of the dealer. When summer and autumn come round the house organ should feature an analysis of the car—analysis from the salesman's viewpoint rather than from the engineer's. The salesman must see the car as it must eventually be presented for sale; he must see the warp and woof that make the arguments with which he is going to make the sales.

This analysis cannot be accomplished in a single issue; it is a fairly long story, and if there is only one issue a month the salesman will find himself poorly informed on his new car by Christmas. Then, during the period when cars are to be announced, the house organ can be published weekly to the greatest advantage. This period may embrace 2 months.

There are other seasons in the year when weekly issues may be published to advantage, one is that period through which we are passing at present and through which we have been passing for the last month, namely the season of maximum selling effort. The warm spring days are here in many parts of the country; in colder sections they will be on hand soon and the greatest sales efforts of the year must be made.

As a means of stimulating sales too often the house organ is published from inside the factory and only reflects factory conceptions of closing business, whereas the views collected from dealers in representative sections of the country are more up-to-the-minute and are flowing over with practical methods of business that pass the factory conceptions into the background. A much greater interest among dealers can be developed when the "ways and means" of the fellow dealer are analyzed than when everything is a sermon from the general manager of sales or the president. News from the firing line is always welcome; it generally contains the real kernel. But it takes work to get it; good speedy, hustling work, which when done, has proven to be worth while.

Then there are the mid-seasons, between sales and between manufacture, when the house organ is at low tide. Once a month is often enough. It may rarely be read then. But it is needed, the continuity must be kept up, the salesman must not be left to himself, and the interest of the dealer may be kept at the 100 per cent point. At such times it is foolish to talk sales, foolish to talk mechanics. These inter-periods are opportune times for other subjects. At such moments interject a little on scientific management for the coming months. Methods for managing forces of salesmen; methods for managing repair departments; methods for managing the tire repair department; methods for managing the accessory department; and methods for a score of other minor departments. Most valuable work can be done at these between moments, work which will prove a welcome relief from the intensity of sales or the analysis of the car.

Not a few publishers of house organs think that they must bring out special editions for any special event in the motoring world, events, perhaps, in which they are not at all interested, and events which every dealer can become conversant with through his class journal or the daily press. The issuing of such specials rarely accomplishes much value, rather it is apt to take away from the general atmosphere of the publication than add to it. It is poor policy to go out of your legitimate field. Cast the seed on fertile soil rather than wasting it.

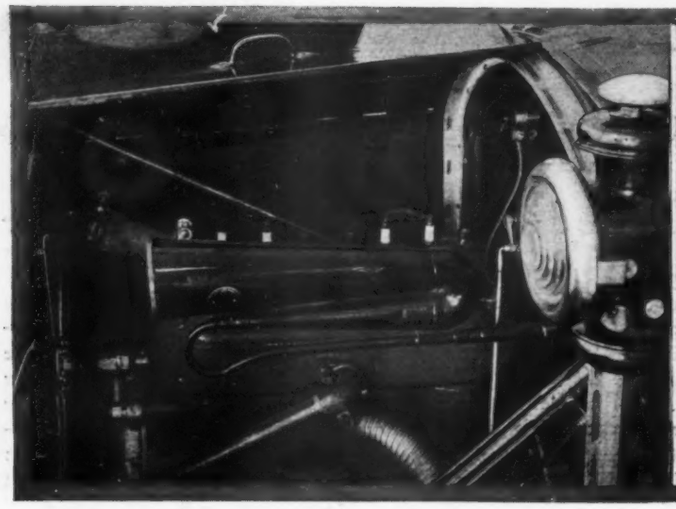


Fig. 1—Left side of Maxwell motor, showing horn mounting

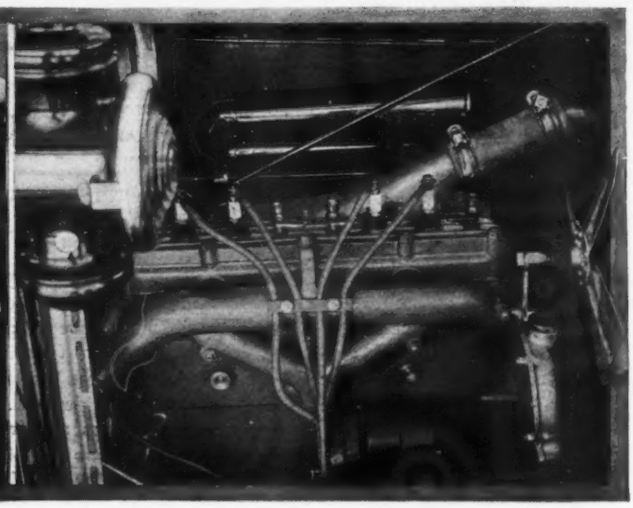


Fig. 2—Right side of motor, with accessories and manifolds

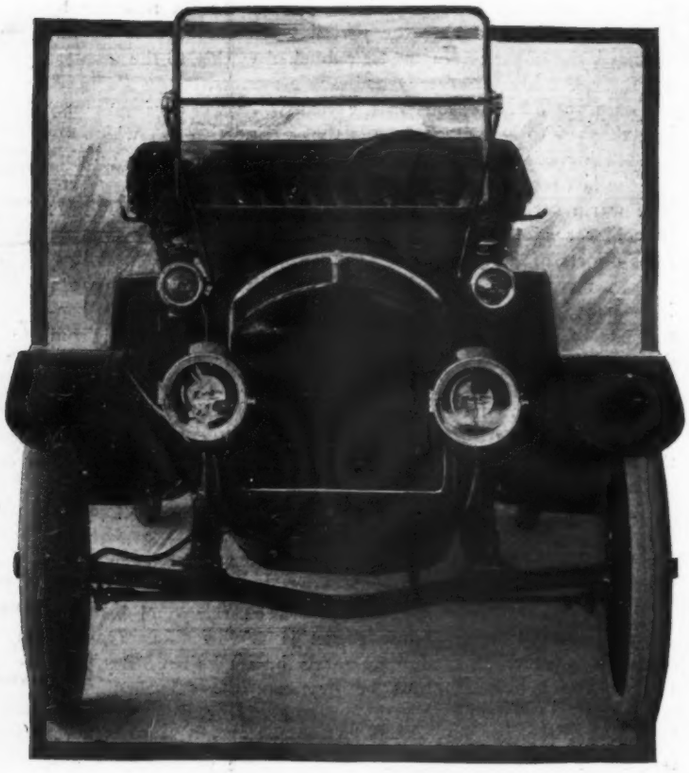


Fig. 3—Front view of Maxwell 25 touring car

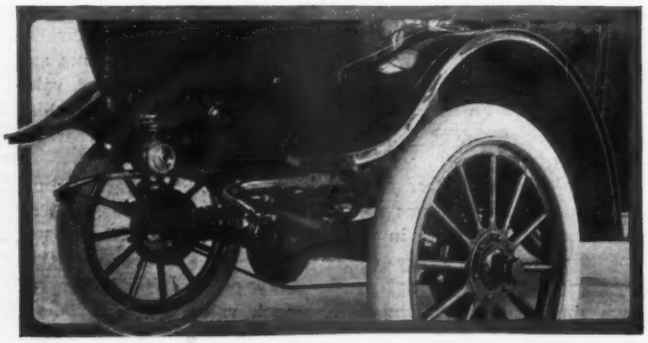


Fig. 4—Rear springs suspension, showing springs shackled to spring horns bolted to frame

Maxwell 25 Is Out

Latest Five-Passenger Car Has Four-Cylinder Block Motor on Three-Point Suspension — European Body Lines

Left Drive and Center Control Are Features

DETROIT, MICH., April 15—The much-heralded Maxwell small touring car which is to sell at the rather startling figure of $725 has at last appeared. This week it is being exhibited to the dealers of the new Maxwell Motor Co., although deliveries will not commence until May 1.

Generally speaking, the car is up to the 1913 standard in every respect and reveals a slightly foreign look, as far as the hood is concerned at least. This slopes slightly from the dash to the radiator.

The body is of the usual five-passenger type with wide doors and black leather upholstering. Mechanically there is nothing out of the ordinary about the new 25, although it involves a number of features in accordance with the latest engineering dictates.

Motor Is of L-Head Type

The motor develops 25 horsepower and is of the block-cast type of compact design. It is of the four-cylinder, L-head type with a bore of 3⅝ inches and a stroke of 4.5 inches, giving a stroke bore ratia of 1.24.

The valves are all on the right and are inclosed by easily removed cover plates. They are 1⅞ inches in diameter. A removable plate gives access to the valve heads.

The cooling is by the thermo-syphon system with a large water outlet at the top of the motor integral with the head and extending the entire length of the top.

Both the crankshaft and the camshaft are mounted on two bearings each. The pistons are provided with three eccentric rings each, and are of ample length.

The power plant is carried at three points, two supports connecting directly with the main frame at the rear and a swivel support at the forward end resting on the front cross member just back of the radiator. The various motor bearing dimensions are as follows:

Camshaft bearings: Front, 1 inch diameter by 2 inches length;

rear, 1 inch diameter by 1¾ inch length. Crankshaft bearings: Front, 1⅞ inches diameter by 25 inches length; rear, 1⅞ inches diameter by 3 inches length; connecting-rod, lower bearings, 1⅞ inches diameter by 1.5 inches length; wristpin bearings, ¾ inch diameter by 2¾ inches length.

The lubrication system is of the conventional splash type, employing a plunger pump located at the front in the timing gear-case. This pump is actuated by a small connecting rod which is really an eccentric. The oil is pumped from the lower part of the crankcase up to the individual troughs and after it has been thrown to the various contact surfaces by the travel of the connecting rods it finds its way back to the reservoir where it is strained before being recirculated.

The ignition system is of the single type high-tension employing Simms magneto without the use of batteries. The magneto is placed on the right side of the motor and has regulation spark control. The carbureter is located on the left and is of the Holley make.

The cone clutch is not inclosed but located within the flywheel in the regular way. It is Raybestos-lined and has a diameter of 12.5 inches.

Central Gear Shift Lever

The transmission is placed amidships and has three forward speeds. It is a selective sliding gear type and the gearshaft lever passes directly upward for center control. This shift lever is of the swivel type.

From the gearbox the drive passes to the rear axle through a standard propeller shaft inclosed within a torque tube which is provided with a ball universal joint at the forward end just back of the gearbox. There are no radius rods, the tube taking the entire drive.

The rear axle is a three-quarter-floating design in which no load is carried by the driving shafts which are inclosed within the axle tubes, on which the wheel bearings are located.

The brakes operate on drums on the rear wheels and are of the internal expanding (emergency) and external contracting (service) type. The diameter of these brakes is 10 inches and the width is 1¼ inches.

The frame is of the regular pressed-steel channel section construction, and is provided with three cross-members to brace it. One of these is at the forward end and also forms the front motor support, while the second is in line with the rear spring front hanger, and the third member is at the extreme rear.

Both front and rear springs are half-elliptic, the sizes being: Front, 32 inches length; 1¾ inches width; rear, 40 inches length; 1¾ inches width.

The rear springs shackle at their rear ends to spring horns which in turn bolt to the rear corners of the frame.

The wheels are of the wood artillery type and carry 3 by 3.5-inch clincher tires. The tread is 56 inches for standard roads, although an option of 60 inches is given for Southern driving. Wheelbase is 102 inches and clearance 9 1-2 inches.

The control features are standard, and include pedal for operating the service brakes and for the clutch. The steering wheel is on the left, while the gearshaft lever is in the center together with the emergency brake lever. The ratchet for this brake lever is not placed above the floorboards as usually seen but is mounted underneath, fastening directly to the gearcase. On the dash a small handle is provided for carbureter adjustment.

The body is very roomy and seats five comfortably. A special feature of the model 25 body design is the absence of a door at the left front side. The driver enters from the other side. Standard colors for this car are dark blue with narrow black stripe. The equipment includes top and side curtains with top boot, windshield, gas head lights and gas tank, oil side and rear lamps, horn mounted on the motor and under the hood, Stewart-Warner speedometer.

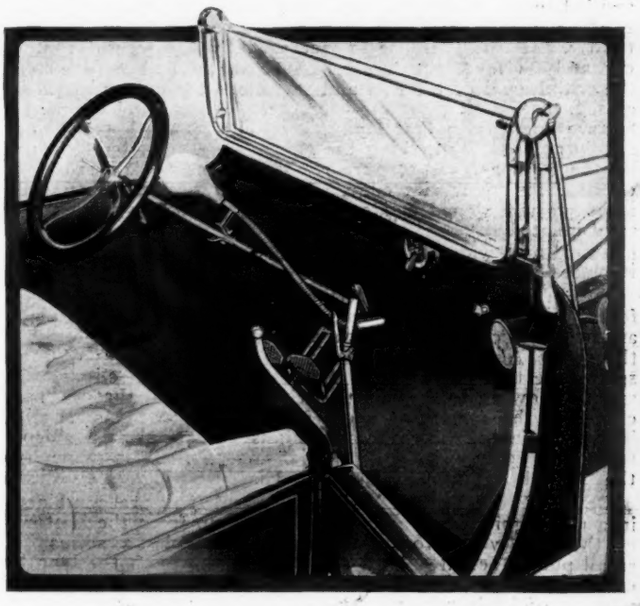
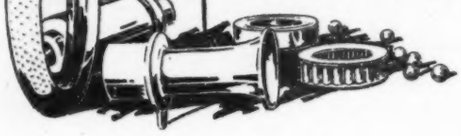


Fig. 6—Driver's seat, showing steer and control

Fig. 5—Side view of new Maxwell touring car, a characteristic 1913 design, with straight, clear lines

Accessories for the Automobilist



THE recent automobile shows at New York, Chicago and Boston included so many exhibits of accessories that it was impossible to describe them in the show issues of THE AUTOMOBILE. Some of these devices for the comfort of the automobilist are mentioned herewith:

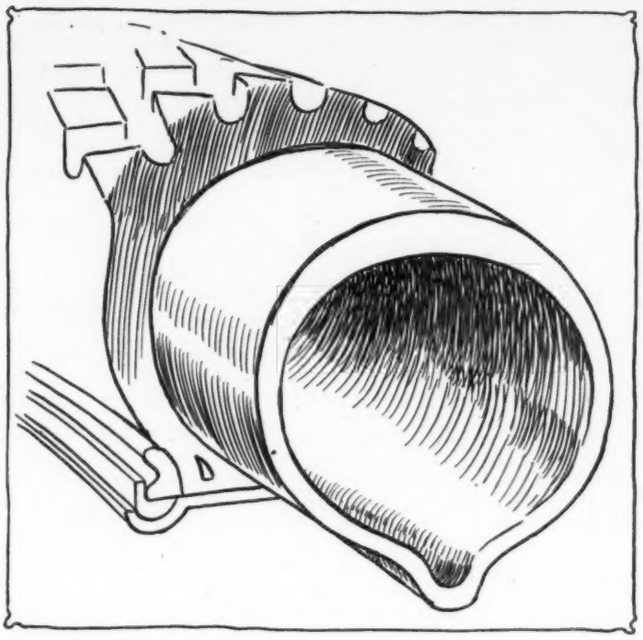
Vail-Osgood Tire Tube—A puncture-closing inner tube is being manufactured by the Vail-Osgood Rubber Products Co., Chicago, Ill. The mechanical principles utilized and applied in the tire are as follows: Pure rubber of sufficient thickness, when confined by side pressure, will hug a nail tightly. If this pressure is increased by the weight of the car and its load, the side pressure mentioned will permit the withdrawal of the nail and will close the cut and hold it closed, maintaining the air pressure. The method of manufacture consists in first laying a strong foundation strip on the form used for making the tinner tube, then building up on the form a layer of pure rubber, .38-inch thick, tapering off at the side or rim edge. After vulvanizing the tube is removed and turned inside out. When placed in the casing aand inflated the thicker portion of the wall of the tube is so confined and under pressure that in the event of a puncture it closes automatically.

Tuthill's Titanic Spring, which has been on the market for some time, has been designed to replace those on standard makes of cars. It is guaranteed against breakage between the clips. According to the makers, the advantages of this spring are that 90 per cent. of the breakages are eliminated and that, owing to the fact that there is no hole through the center of the spring, 25 per cent. is added to the strength. The material of which the spring is composed is a silico-manganese composition of special analysis. It is made by the Tuthill Spring Co., Chicago, Ill.

Detroit Force-Feed Oil—The oiler and tank are combined in a rectangular box. The oil is drawn up from the bottom of the box which forms the oil reservoir by a series of small pumps actuated by a shaft passing through the length of the box. The number of these pumps depends on the number of leads required by the particular motor to which the oiler is fitted. The shaft has a worm upon it for each small pump which gives a reciprocating drive to this part of the mechanism. The oil is taken up through the vertical lead and dropped down to the tubes which carry the oil through the motor. The ends of the lead running up from the bottom of the box project through the top of the box and are curved over to allow the oil to drop down into the heads of the motor leads which are cup shaped. The top of the box is covered with glass to allow the operator to observe the flow of oil. Each pump can have the length of its stroke regulated so that the flow of oil is under control. The action of the lubricator is shown on page 867. The device is made by the Detroit Lubricator Co., Detroit, Mich.

The Campbell All-in-Mesh Gear Transmission is always in mesh. This principle is secured by the use of a tilting or rolling key which forms internal contact with the gears. The transmitting action is obtained by merely sliding the key or keys along the groove in the shaft until they slip under the rings of the desired gear after which the key automatically and with positive action tilts into contact with a series of lugs placed on the inner circumference of the gear. The gear becomes a part of the shaft, turning with it and transmitting the power from the motor to the rear axle. The gear is illustrated in Fig. ??, in which the tilting keys may be observed. This gear was designed by the Economy Equipping Co., Chicago, Ill.

The Boston Starter is a mechanical starter which is operated from the seat. A cable projects through the dash which, when pulled by the operator, turns the wheel in turn connected by chain to the crankshaft. A pull on the cable spins the motor at a sufficient speed for starting. An automatic release is provided as a protection in case of backfire and as a further precaution the spark is automatically fully retarded before the engine is turned over. The starter can be attached without interfering in any way with the car and does not change the appearance of the latter as the whole device, with the exception of the starting handle, is located beneath the hood. A big advantage of this starter is that it is ready for use whenever the car becomes stalled. It is made by the Auto Appliance Co., Boston, Massachusetts.



Vail-Osgood puncture-closing inner tube

Dependo Gasoline Gauge attaches to the dash and indicates at a glance the amount of gasoline in the tank. It operates up-hill or down and is of simple construction. The needle is swung from the top of the dial and the scale, reading in gallons, is at the lower part. At any moment the amount of gasoline in the tank can be determined from the gauge. This gauge can be fitted to any car using a gravity feed tank. It is made by C. F. Roper & Co., Hopedale, Mass.

O-Tak-A Jr. is a special tool for removing punctured tires. As shown in the illustration, page 867, it is similar in form to a pair of pliers, with curved hooks. One end slips beneath the rim and the other pushes up against the tire. When the handle is squeezed the point of the instrument pushes the tire away from the clincher rim. After the tire is loosened the tool can be raised, thus lifting the bead away from the rim, allowing the tire to be easily removed. It is made by O-Tak-A Tire Remover Co., LeRoy, N. Y.

Ko-Nek-To Battery Terminal Blocks—Many wires are broken because the installation chafes across the edge of the battery box. This results in short-circuits and broken leads. The Ko-Nek-To apparatus changes the terminal points to the exterior of the battery box and renders it possible to disconnect wires rapidly and to remake the connections without the necessity of soldering joints. The Ko-Nek-To battery terminal blocks are designed to be used with all electric cranking and lighting systems and since the connections are securely made they greatly assist in maintaining the required efficiency and output. The inside installation is permanent and is vibration proof. The blocks are made by the Detroit Electrical Appliance Co., Detroit, Mich.

Halladay Steel Goods—Automobile specialties manufactured by the L. P. Halladay Co., Streator, Ill., include automobile bumpers, tire holders, baggage carriers, license brackets and gear-shifting sets made to any design. The Halladay Imperial bumper is made of Channel steel. It is entirely self-contained, adjustable to all styles of cars. The tire holders, which are also manufactured by this company, are made of malleable iron, designed to attach to frame and of sufficient size to hold two demountable rims or wheels. The set consists of two frame arms and running-board cup, finished in black japan. The baggage carrier is designed to be attached on the step or running board of the car. It consists of a clamp, attached to the running board, with

two upright attachments with eyelets through which there are two straps. The baggage is held to the running board by these straps. The company also manufactures special parts, such as gear-shifting sets, foot pedals, rods and connections, according to any design.

Heco Primer Spark-Plug—The advantage of this priming plug is that the cup is directly over the plug. The priming part can be used for cleaning the plug as well as for priming the motor. When cleaning the plug it is only necessary to open the cup while the engine is running and allow the oil and soot to be blown off the points. When used for priming it is operated in the usual manner by opening the primer with the handle and pouring in a few drops of gasoline. It is made by the Heinze Electric Co., Lowell, Mass.

Vanguard Positive Shields—The Vanguard Manufacturing Co., Detroit, Mich., manufactures four types of windshields, all of which are of the two-pane type, and two of which have double-acting panes. Nos. 74 and 75 are of the latter class. They are actuated by means of a loop attached to a hinge, which is of the ball-bearing type, and each of the shield panes may be placed in any desired position. Nos. 77 and 78 are different from the first two in that only the upper pane is movable. The position of this pane is obtained by the loosening of the loop at one of the hinges, as in the first two types, and the tightening of it to keep the shield rigid.

Illinois Tire Filler—The Illinois Tire Filler Co., Chicago, Ill., makes a filler for tires which is injected into the tube in liquid form by a gun. It is claimed that after the liquid has performed its work inside the tube it is impossible to depress the tire by any pressure. The company claims that the pressure in the tire may be reduced but the tire will not be affected.

Aull-Sides-Klean Polish—The Aull-Sides-Klean Co., Cincinnati, O., is turning out a brass and nickel polish which is waterproof. This product will polish under water. The same company is producing an automobile body and furniture polish, which cleans and polishes at the same time. Both of these products go under the trade name of A-S-K.

Columbus Two-Pane Shields—The Columbus Auto Parts Co., Columbus, O., manufactures five different windshields. They are all of the two-pane type, and are so constructed as to move in an entire circle. The action of both panes of the shield is positive and simultaneous. The frame of the pane is of round section and is held in place by two grip members attached to a double-acting, compensating-gear hinge. The frame and hinges are made of heavy-gauge brass.

Mesinger Rebound Check—This shock absorbing device which is manufactured by the H. and F. Mesinger Manufacturing Company, New York, consists of two coiled springs attached at their upper ends to the car frame through suitable brackets, one a little forward of the axle and the other just to the rear of it. A leather strap passing under the axle connects to each of these springs at their lower ends. Thus the rebound is checked by the action of these two springs working against the upward jerk of the frame after depression through the agency of the connecting strap. The strap is provided with a buckle so that its length may be made to conform with the required spring tension and with the distance between axle and frame.

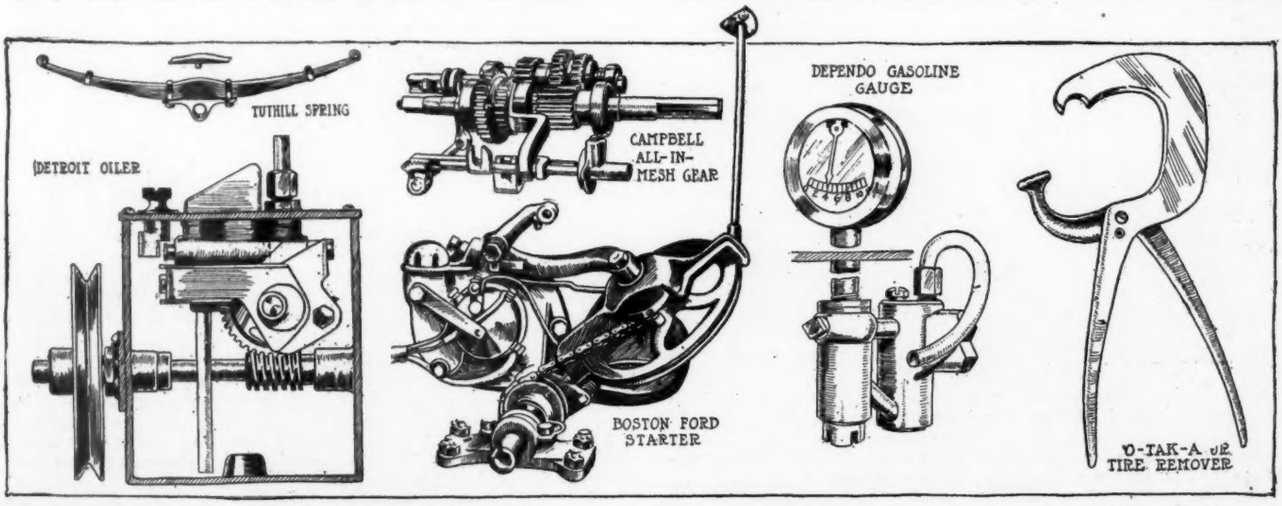
Weaver Garage Jacks—The Weaver automobile twin-jacks are manufactured by the Weaver Manufacturing Company, Springfield, Ill. It consists of a triangular pressed-steel frame the ends of which are mounted on three caster wheels, containing ball-bearings. Two of the side members are connected by a horizontal cross member, at the ends of which two nuts carrying bevel-gear faces are mounted on ball-bearings. The bevel faces are engaged by bevel gears fixed to the above-mentioned cross member, which latter is in turn agitated by a bevel gear mounted on a shaft having a crank at its end. The gear ratio between the crank and the gear carrying the jack is 400 to 1, so that very heavy loads are easily elevated. The combined use of two outfits may take the place of a turntable. It has a double-reinforced steel tube with a brass tube drawn over. It is clamped to the frame of the car and connected thereto by a .75-inch cold-rolled steel rod, which has an oil-tempered spiral spring around the same. The latter is connected to the clamps by four bolts. The clamps are of solid brass.

Grinnell Automobile Glove—The Morrison-Ricker Manufacturing Co., Grinnell, Ia., manufactures an assortment of gloves for the automobilist and cyclist. A ventilated or unventilated glove called the Grinnell is one of the types designed for the automobilist. It is made of colt-skin and is washable in soap and water or gasoline. It fits the wrist tightly and has a quick-adjusting slide fastener and a stiff leather-lined cuff. A short-wrist glove made of colt-skin hide and one specially made for the cyclist, with a new double palm, also of colt-skin, are manufactured. A glove called the Grip-Tite has just been manufactured. The Grip-Tite has an extra palm, sewed so that the leather puckers between the stitches to form corrugations which permit a firm grasp on the handle bars or steering wheel.

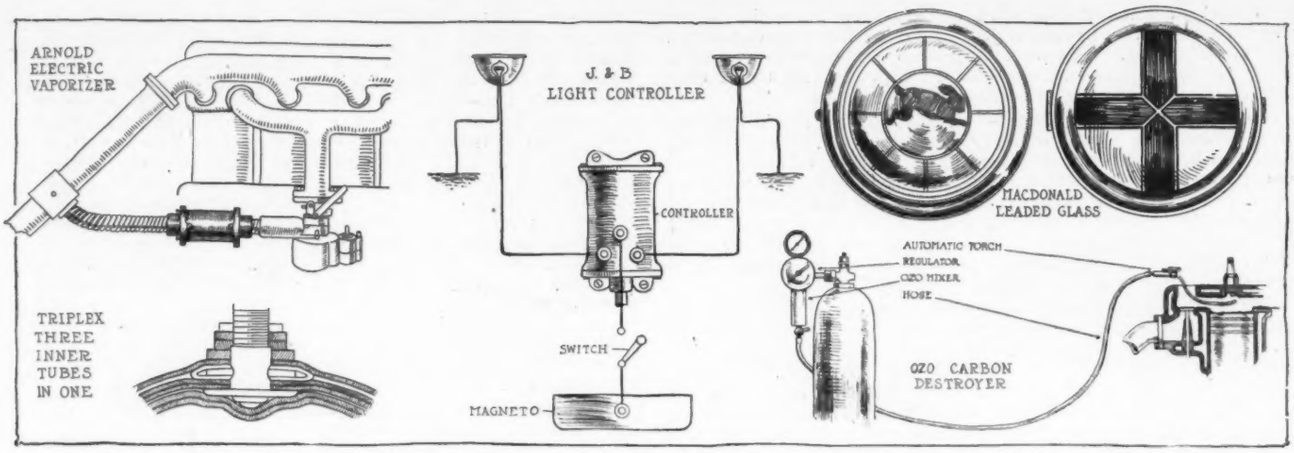
Pratt Automobile Jack—The W. E. Pratt Manufacturing Co., Chicago, Ill., manufactures malleable-iron castings, automobile jacks and accessories. The Pratt jack is made of malleable iron, finished in aluminum bronze. There are only six parts, held together by two bolts in a one-piece frame. The standard is so made that it cannot leave the upright support; it raises the load one notch at a time on every downward stroke. A small trigger, at the base of the frame, determines whether the jack is being raised or lowered. The company also manufactures a spring bumper.

J. H. Tonneau Shield—The J. H. Tonneau Shield Co., New York City, manufactures a windshield designed to protect the occupants of the rear seats of an open car. This shield is collapsible and consists of three sections hinged together at the vertical members of the frames which hold the edges of the transparent panes. To the two hinges connecting the three sections, two horizontal arms are secured the other ends of which are fastened to the rear of the driver's seat. The two small side sections or either of them may be folded over the large main section, and the whole arrangement may be turned about the axis formed by the two joints, so that the shield may be used as a table. The shield frame is made of brass and oxidized steel, and a waterproof curtain is attached to the lower edges of all sections, so as to protect the legs of the passengers against rain.

Herroline Fuel Enricher—Herroline, a gasoline improver,



Sketches of the Tuthill spring, Detroit oiler, Campbell all-in-mesh gear, Boston starter, Dependo gauge and O-Tak-A Jr. tire tool



Arnold vaporizer, Triplex inner tube, J. & B. light controller, Ozo carbon destroyer and MacDonald leaded glass

is manufactured by the Improved Gasoline & Oil Co., Chicago, Ill. It is the discovery and invention of W. H. Herron. Herroline consists principally of hexane and iso-hexane, with a very small quantity of sulphur. The chemical formula is approximately C_6H_{14}.

Arnold Electric Vaporizer is an electric heating device placed in the air intake of the carbureter in order to secure hot air for starting purposes. The vaporizer consists of an electric resistance coil, battery and switch. When the switch is thrown on the vaporizer becomes hot in 30 seconds. The carbureter is then flooded in the usual manner and the motor started. The switch controlling the vaporizer is not shut off until the motor becomes sufficiently warm to run without the aid of the preheated air. This is made by the Arnold Electric Co., Boston, Mass.

The Triplex inner tube is, as its name suggests, in reality three different tubes, three being used so that in case one is punctured it calls for a second inflation to bring the second tube into use and in case of its puncturing an additional inflation will bring the third tube into service. A three-way valve arrangement is used so that each tube can be inflated separately. When the outer tube is being used the two inner ones fold against the inside half of the outer tube so as to be away from the tread of the tire in case of puncture. Inflating the second tube simply causes it to fill all the space within the first one. Inflating the third tube, which is the innermost of all, acts in a similar manner. The tube is made by the Triplex Tube Company, Boston, Mass.

J. and B. Light Controller—This switch controls the output of the Ford magneto so that when this instrument is used to generate current for the lights the bulbs are held at their full incandescence, regardless of the motor speed. When the motor is running at high speed the bulb goes beyond its full incandescence and the filament is fused out. The controller is installed directly forward of the carbureter. It is operated by the lever which controls the throttle. The use of the device enables the current to be controlled to such an extent that it can never burn out from excess current. The only labor necessary is to drill three 3-16-inch holes between the motor base and frame. The connecting levers are arranged to fit the present carbureter and the wiring is according to the diagram given in the accompanying illustration. This is made by the J. and B. Mfg. Co., Pittsfield, Mass.

MacDonald Leaded Glass is used in leaded glass headlights which, while not appealing to those using the car for country travel, make excellent distinguishing marks for the automobile when used in city work. Town cars are especially adapted for these lights. The side and tail lights are greatly beautified by the use of these distinguishing designs which are made up in the form of monograms, crests, emblems, initials or devices in desired colors and set in the automobile lamp. Red Cross marks for physicians are particularly appropriate in leaded glass. This glass is made by Donald N. MacDonald, Boston, Mass.

Ozo Carbon Remover is a garage outfit consisting of an oxygen tank and burner for burning out carbon from the cylinder by the aid of Ozo. Ozo is a flameless gas which consumes the carbon without the use of fire. The outfit is operated by leading the tube from the gas tank and regulating apparatus through the spark-plug or valve cap of the cylinder. The use of this apparatus does not require the motor to be dismounted further than the removal of the spark-plug. The work can be done on an ordinary four-cylinder motor in 20 minutes. It is operated by one man who merely holds the nozzle of the hose through the opening of the cylinder until the carbon has been completely burned from the cylinder. The temperature of combustion is not high enough to fuse the plugs or to do any other damage. This device is made by the Ozo Co., Boston, Mass.

Cook's Automobile Oils—The Albany Lubricating Co., New York City, manufactures the Cook's lubricant and Albany automobile oils and greases. The company claims that its greases will not gum or clog up or will not run or leak out of the gear case or cannot be thrown off the gears by centrifugal force or affected by changes of temperature.

Head-Light Glare Remover—It is difficult to drive against the glare of approaching headlights. In order to rob these of dazzling power this device has been designed. It consists of an amber-colored glass clipped to the windshield in such a position that the driver can see through it by merely inclining his head. When a car is approaching and the glare becomes too dazzling it is merely necessary to look through the colored glass. It is made by William L. Toby, East Boston, Mass.

The New Era tire casing, a product of the New Era Tire & Rubber Company, Boston, Mass., is made up of five layers of para gum alternating with layers of coarse Egyptian cotton fabric. Outside of these is placed the cushion and breaker strip made of pure gum and of liberal thickness in the tread portion. Outside of this comes the binder formed of compounded rubber, thickened slightly at the tread and extending clear around the fabric and forming the outside lower wall of the tire. Lastly comes the tread of white rubber. These casings are made in standard clincher sizes.

Whitney differential roller bearings are interchangeable with the standard series of ball and roller bearings now on the market. They are adjustable tapered cup and cone bearings, but without the objectionable feature of tapered rollers having restraining shoulders and guiding members to keep them in position.

All loads, both radial and thrust, resolve themselves into forces delivered at right angles to the axis of the rolls; which consequently transmit their loads normal to the contact surfaces without tendency to creep, either one way or the other.

The containing cage is simply a floating guard member, and is not subjected to any of the load forces carried or transmitted by the bearings or rollers.

Motorol, a lubricant produced by the N. Y. & N. J. Lubricant Co., New York City, is made in six grades. It is claimed to be non-carbonizing, made from the selection of the crude oil to the last process of refining. This company also manufactures a product called Non-Fluid Oil, in two grades. This oil varies in consistency, according to what gravity of mineral oil is used, and it is claimed will not drip or cause a waste.

The A. W. Harris Oil Co., Providence, R. I., is this year producing several grades of oil, also a metal polish called Scouree. The light grade of oil is especially adapted for high-speed motors, having a high fluidity and being practically carbonless. A heavy bodied oil of exceptionally high flash test is also made. Two grades of transmission oil are also produced by this company.

The Albany Lubricating Co., New York City, is manufacturing four grades of lubricants. The extra-light, of golden yellow color, is especially adapted to closely fitted pistons

and high compression water-cooled engines; the light, a medium body and high flash point adapted for compression, splash or gravity feed systems in any type of water cooled motors; the medium, heavier than the previous and of best use with loose pistons as an aid for retaining the compression; and the heavy, of use only where the piston is badly worn and where extreme heat is developed. These oils are put up in barrels ranging from 30 to 50 gallons.

The Texas Co., New York City, is producing Texaco, a motor oil, which it claims has a zero cold, remaining fluid in mid-winter.

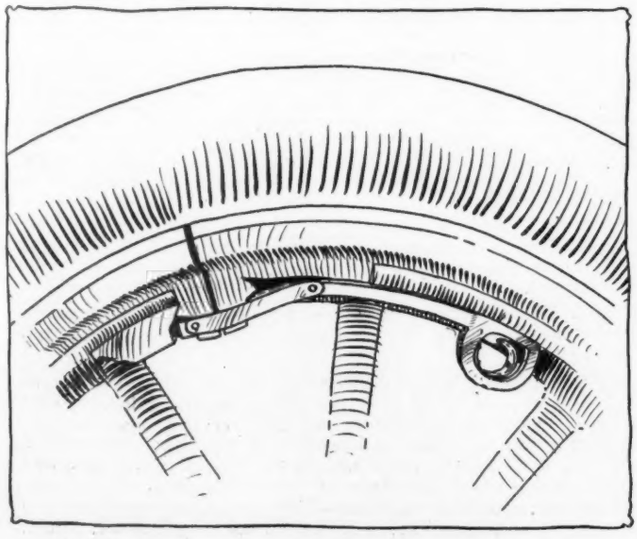
Gargoyle, a product of the Vacuum Oil Co., Rochester, N. Y., is made for the lubrication of all parts of internal combustion engines used for marine purposes. Mobilubricant, another product, is a grease prepared for use in compression cups and gearcases.

Oilzum is a trade-mark of the White & Bagley Co., Worcester, Mass., signifying several grades of oils and greases. These oils, it is claimed, are absolutely carbonless and especially adapted for winter uses. A smooth mineral grease of proper consistency for packing axles, ball and roller bearings, etc., is also produced. Washzum and Cleanzum, the former for cleansing the car and the latter for the hands, are also made.

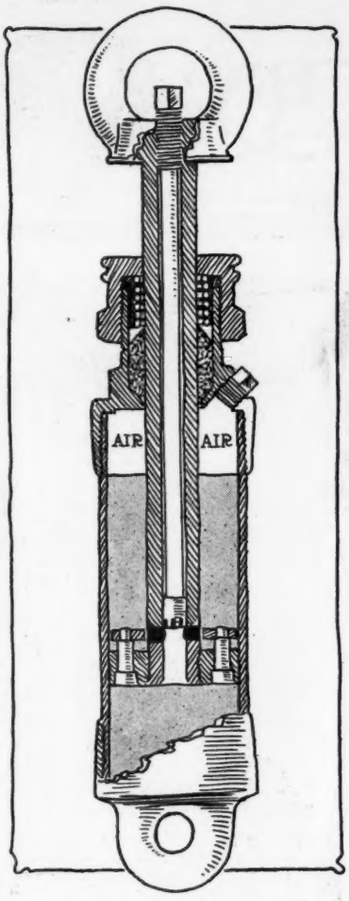
The Turner Brass Works, Sycamore, Ill., is manufacturing motor washers. These are made in three sizes, 1 quart, 2 gallon and 5-gallon tanks. The 1-quart tank is a small hand machine made of drawn brass, with the bottom brazed into place and fitted with a Turner non-leaking filler plug. The handle is an automatic pump, which forces the liquid through an adjustable nozzle. The 2 and 5-gallon tanks are of drawn steel, equipped with a pressure gauge registering up to 100 pounds, having large hand pumps, also connections so they may be attached to a pressure tank or to a power-driven pump in garages where such are used. These washers are fitted with 10 feet of cloth insertion rubber hose and adjustable nozzle. Kerosene may be used and the same results obtained as by using gasoline and is much cheaper. By merely turning the nozzle either a finely-divided spray or an intense needle stream may be obtained.

The Presto demountable rim, the product of the Presto Inter-Rim Co., Boston, Mass., consists of a split side locking ring which rests in a V-shaped groove in the outer edge of the wheel felloe. Each end of this split ring has a hook-shaped piece which is caught between a toggle mounted on the permanent band on the wheel felloe. After positioning the demountable rim and tire on the felloe it is only necessary to position the split locking ring and press the toggle locking device up into position against the wheel felloe. There is not any nut or other locking arrangement used.

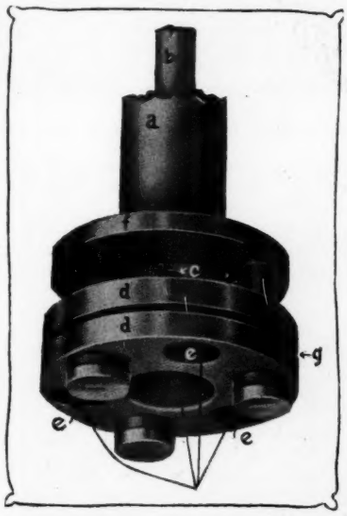
Bair Auto Top Holder, made by the Auto Specialties Mfg. Co., Chicago, Ill., is designed to do away with the unsightly strap device. It is a mechanical device consisting of a rigid separator and a clamp which holds the bows tightly in place and does not permit the weight of the top to be carried entirely by the bottom bow but distributes it equally etween each of the bows. The top holders are sightly and can be manipulated quickly.



Locking device on the Presto demountable rim



General assembly of the Flentje shock absorber, showing how the liquid and air are distributed under normal conditions, that is to say, when the car on which the device is mounted is traveling over a smooth and level road surface. Under these conditions the action of the spring is not interfered with



Flentje piston. The hollow piston rod a, contains a valve b, for regulating the opening c. There are three bevelled holes, e, through which the liquid passes unless checked by the non-return valve g which covers the holes

The Flentje shock absorber is a hydraulic recoil absorber. The energy of the recoil is absorbed by making it do work in forcing a liquid called oil-o-mica through small openings in a piston rod. A sectional view of the device given in the accompanying illustration shows it to be of plunger formation, a movable piston being carried in a cylinder about 80 per cent. full of liquid. The weight of the car is carried by the car spring, but a movement of the car causes a corresponding movement of the piston through the liquid. At the top of the cylinder is a packing box stuffed with braided expansion packing held in place by a spiral spring. This prevents leakage past the piston rod.

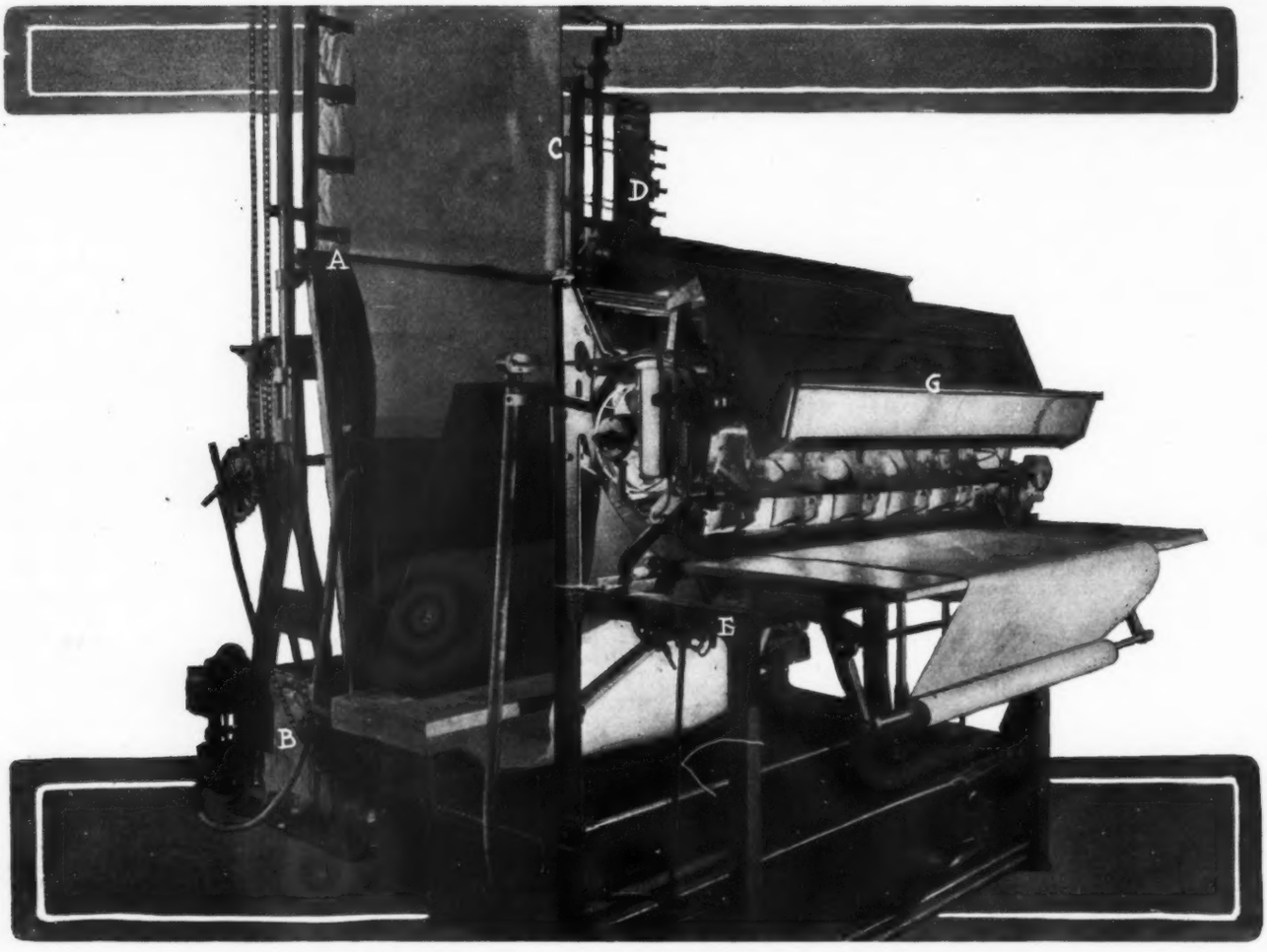
A glance at the piston will show that it is of unique construction. Through it there are three beveled holes which form the relief passages for the fluid on the down stroke. A check valve rests upon the piston which closes the three holes on the recoil stroke. When these coil holes are closed the only passage available for the fluid is through the small hole in the hollow piston rod. The entrance to this opening in the piston rod can be controled by a needle valve regulated from the top of the rod. This forms the only adjustment required to regulate the action of the device.

When passing over smooth roads the action of the spring is not interfered with as the amount of work given up in passing the liquid through the recoil opening is very slight. On a severe jounce, however, the air on top of the liquid mixes with the latter and expands it, checking the violent recoil.

The Edmunds & Jones Mfg. Co., Detroit, Mich., is this year producing several grades of lamps, including gas and electric, and also a generator. This company produces a special lamp with parabolic reflectors, guaranteed to give highest efficiency, having an adjustable device.

The B. & L. Auto Lamp Co., New York City, is manufacturing automobile lamps and generators suitable for large touring cars, runabouts and motorcycles. All the lamps are soldered and riveted, standing the constant vibration of large cars and all sort of hard service.

Factory Miscellany



Special blueprint machine used in the factory of the Willys-Overland Co., Toledo, O.

AT the gateway to the shop stands the blueprint machine. Before the parts are turned out the tracings must pass through this machine so that reproductions of the drawings showing the details of each part can pass to the workmen. The machine shown herewith is the improved instrument used in the Overland factory. The machine is designed to produce the largest possible number of prints at the lowest possible cost. It is in daily operation at the factory in Toledo. The machine is fed from a 42-inch roll of blueprint paper, and its output of finished prints is about 100 yards an hour. The speed of the machine can be increased up to 200 yards an hour if desired. The tracings are fed past a bank of arc lamps and are returned to the tracing tray marked G, at the operator's hand as he stands at the front of the machine. A canvas belt with tension springs is used to convey the paper and tracings through the machine. From the printing machine the paper passes automatically to the washing and drying machine. These machines can be arranged to work independently or as a unit. In the above illustration A is the spray pipe feeding the water over the paper which runs by gravity to the washing tank B. C is the electric drier composed of a series of resistance coils. D is a set of switches providing eleven gradations of heat, enabling the operator to regulate the temperature according to the speed of output at which the printer E is operating.

GRAY & DAVIS Plan Factory—Gray & Davis, Boston, Mass., manufacturers of automobile accessories, will establish a factory at Cambridge, Mass. The proposed building will be five stories high, 381 1-2 feet long by 81 feet wide on the first floor and 61 feet above that, and is designed to allow for future additions and a power house. It will be absolutely fireproof throughout, being constructed of reinforced concrete. There will be a large showroom on the first floor, while the offices will be on the second floor, occupying the full width of the building for a length of 200 feet. The architects have given the windows 70 per cent. of the wall area. Work is being rushed at present.

Alston Saw Company's Factory—The Alston Saw & File Co. will build a factory, 4 by 103 feet at Folcroft, Pa.

New Automobile Factory—C. H. Lambert, formerly with the W. J. Gillette Mfg. Co., Louisville, Ky., will establish an automobile factory there. Final details have not yet been determined.

Bent Rim Company Builds—The Bent Rim Co., Lowell, Mich., will build a 50-foot square addition to its present plant.

Alliance Mill Factory Planned—The Alliance Rubber Co., Alliance, O., has made plans for the erection of a two-story brick mill factory building, 50 by 150 feet.

High Point Company Adds—The High Point Motor Co., is building an addition to its plant at High Point, Tenn., and contemplates the installation of new equipment.

Fire Damages Oliver Plant—Fire recently burned out the storage room of the Oliver Motor Truck Co., Detroit, Mich., with an estimated damage to the stock of about $15,000.

Gibson Looking for Site—The Gibson Motor Car Co., Pittsburgh, Pa., is looking for a site for an automobile plant. It contemplates manufacturing a commercial truck adapted to Pittsburgh's topographical conditions.

Tire Plant in Jacksonville—Jacksonville, Fla., will have a big industrial plant, employing some 500 hands and turning out 300 tires per day, together with other automobile accessories in which rubber is used, to be known as the Seminole Rubber Co., a concern with a $1,000,000 capital.

Racine Company's Factory—The Chicago Rubber Clothing Co. recently dedicated a large new four-story factory building, forming the largest unit in the factory group at Racine, Wis., where the company has its main works and headquarters. The new building will be devoted exclusively to the manufacture of motorists' apparel of all kinds.

Detroit Steel Products Adds—The Detroit Steel Products Co., Detroit, Mich., has taken steps for the establishment of a branch plant in Windsor, Ont., and has acquired a 5-acre site for its factory. The general plan of the plant will be along the lines of the Detroit factory, and it will be equipped for the manufacture of automobile springs, steel windows, etc.

Falls Machine Starts Building—The Falls Machine Co., Sheboygan Falls, Wis., a large manufacturer of motors for the car-building trade, has commenced work on a large addition which will increase the capacity about 40 per cent. The building will be 140 feet long and two stories high, of brick and steel construction. It will contain a large assembling and testing floor.

Building to Cost $100,000—It is announced that W. J. Hughey, of William J. Hughey & Son, Chicago, Ill., manufacturers of limousine and automobile bodies, who recently purchased the 124 feet by 125 feet plot of ground at Prairie avenue and Thirty-third street for $40,000, plans to improve with a concrete four-story building, to cost about $100,000, to be occupied by the company.

Grant-Lee Enlarges—Ground has been broken for a new addition to the factory of the Grant-Lee Machine Co., of Cleveland, O. The additional space will enable the company to increase its production facilities by 50 per cent. and to still further improve its output of transmission gears, timing and bevel gears, worms and differentials. The new building will be constructed of brick and concrete.

Wants Factory Equipment—The Four Wheel Drive Auto Co., Clintonville, Wis., which recently increased its capital to $250,000 and has broken ground for a large group of motor truck shops, is in the market for a 150-horsepower Corliss steam engine, with direct connections; a 175-horsepower boiler; and a long list of tools, including turret lathes, milling machines, grinders, engine lathes and other equipment.

Motor Foundry Company Extends—The capital stock of the Motor Foundry Co., Detroit, Mich., has been increased from $35,000 to $100,000 to provide funds for extensions of plant, necessitated by greater business activity. Several new buildings are to be erected adjoining the present plant. The company employs 265 men and does a grey iron casting business of from 40 to 50 tons a day. The additions will raise its capacity to 80 tons.

Ohio Electric Expands—The Ohio Electric Car Co., Toledo, O., has prepared plans for the building of two additional buildings, one 60 by 240 feet and the other 60 by 240 feet. The first will be two stories and the second three. Both buildings will be erected on the modern daylight plan and will double the capacity. When the buildings are finished the company will increase its force and manufacture many of the parts now purchased from other concerns.

Plan Large Aluminum Works—The Southern Aluminum Co., Whitney, N. C., has given contracts for the erection of a hydro-electric plant. In the construction of this plant about twelve steam shovels, an electrically driven air compressor developing 5,000 horsepower, a plant with a daily capacity of 1,500 cubic yards of stone and concrete, and twenty steel derricks with masts 115 feet high and booms 110 feet long for a 20-foot lift, etc., will be used. About 600,000 yards of masonry will be required, and the contract calls for excavating the aluminum factory site and the spillway and building a dam and power house at the narrows on the Yadkin River, the dam to be about 200 feet high and develop a 177-foot head, generating 220,000 horsepower. All of this energy will be used by the aluminum factory, lighting the plant, and industrial city to be built, etc. It is understood that about $6,000,000 will be invested for the dam, power house, water power, machinery, electrical equipment, aluminum works, industrial city, etc.

Shows, Conventions, Etc.

April 5-19.....Pittsburgh, Pa., Annual Show, East Liberty Market House, Dealers' Association.
April 21-26.....San Antonio, Tex., Annual Show, San Antonio Motor Car Show Co.
June 5, 6, 7.....Detroit, Mich., Midsummer Meeting of Society of Automobile Engineers.
October .....Paris, France, Automobile Show, Grand Palais; 10 days.
November .....London, Eng., Annual Automobile Exhibition, Olympia.

Race Meets, Runs, Hill Climbs, Etc.

April 23-27.....San Antonio, Tex., Track Meet, San Antonio Automobile Club.
April 28-30.....Chicago, Ill., Commercial Vehicle Demonstration, Chicago Motor Club.
May 2.....New York City, Secret Time Run to New Rochelle, Motor Dealers' Contest Association.
May 5-8.....Washington, D. C., Motor Truck Reliability, *Washington Post.*
May 14.....New York City, Start of 2-Day Hudson and Catskill Scenic Tour.
May 30.....Indianapolis, Ind., 500-Mile Race, Speedway.
June 7.....Philadelphia, Pa., Inter-Club Reliability, Quaker City Motor Club, Autombile Clubs of Delaware County, Philadelphia and Germantown.
June 25-28.....Chicago, Ill., Non-Motor-Stop Reliability, Chicago to Boston, Chicago Automobile Club.
July 1.....Indianapolis, Ind., Tour of Indiana Automobile Manufacturers' Association to the Pacific Coast.
July 1-16.....Winnipeg, Man., Motor Plow Competition, Dr. A. W. Bell, Manager.
July 4-5.....Sioux City, S. Dak., Track Meetings, Sioux City Automobile Club and Speedway Association.
July 5-6.....Tacoma, Wash., Road Race, Montemara Festa Automobile Committee.
July 8-16.....Winnipeg, Man., Midsummer Exhibition, A. C. Emmett, Manager.
July 27-28.....Tacoma, Wash., Tacoma Road Races.
Nov. 24.....Savannah, Ga., Vanderbilt Cup Race, Motor Cups Holding Company.
Nov. 27.....Savannah, Ga., Grand Prize Race, Automobile Club of America.

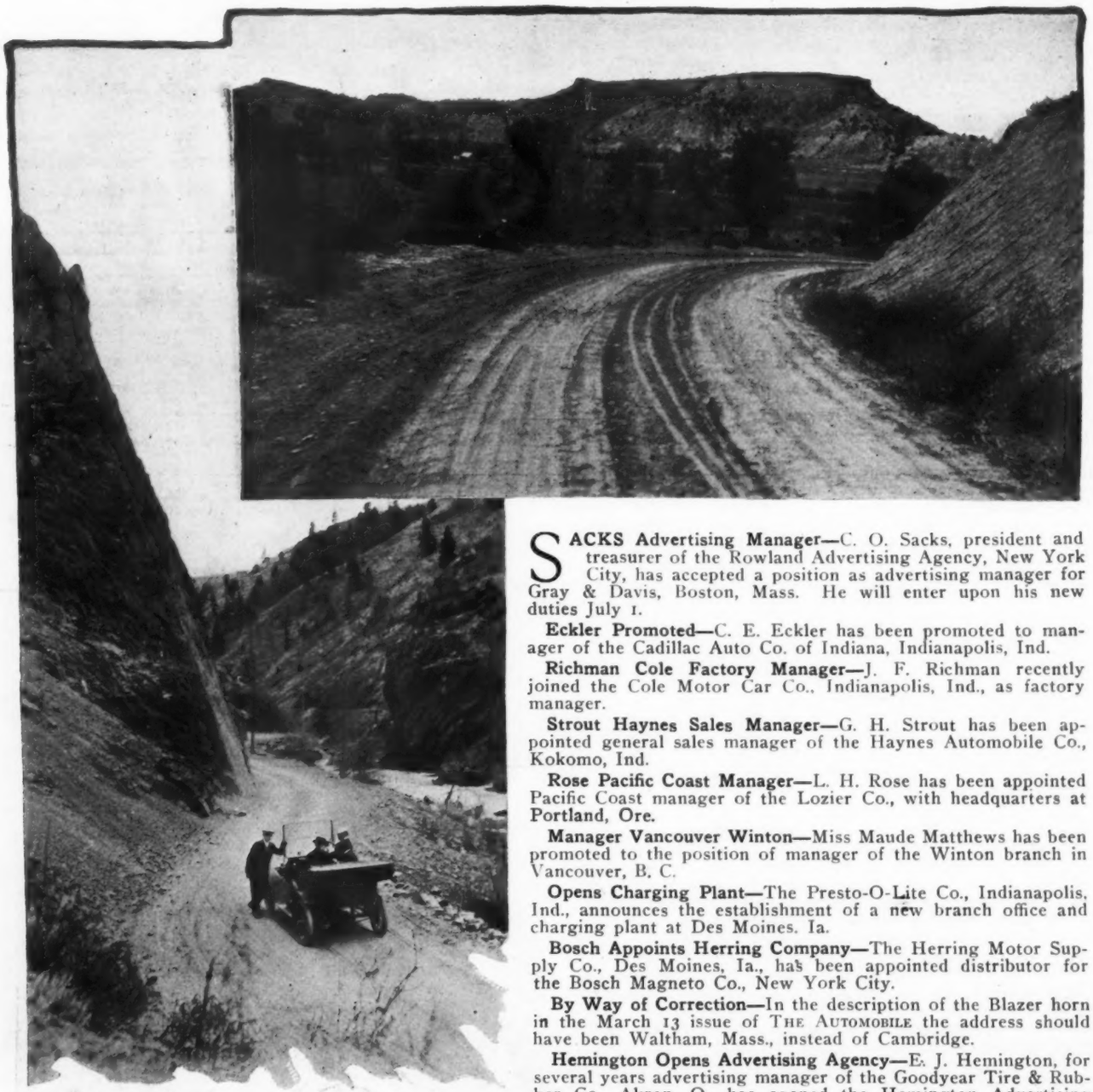
Foreign.

April .....Barcelona, Spain, International Exhibition.
May .....St. Petersburg, Russia, International Automobile Exposition, Building of Michael Maneze, Imperial Automobile Club of Russia.
May 7-10-11.....Paris, France, Sarthe Automobile Meeting and Speed Hill Climbing.
May 11-12.....Palermo, Sicily, Targo-Floria Race.
June 23-28.....London, England, International Road Congress.
July 12.....Amiens, France, Grand Prix Race.
July 13.....Paris, France, French Grand Prix Cyclecar Race.
July 18-26.....London, Eng., Imperial Motor Transport Conference.
Sept. 21.....Boulogne, France, 3-Litre Race.
Sept. 25.....Isle of Man, International Stock-Car Race.
October .....Paris, France, Paris Automobile Show.

The Esterline Co., Lafayette, Ind., has outgrown its present quarters and is now occupying a new three-story factory on South street in Indianapolis, and by May 1 will have increased its working space to over double its present size. The factory in Lafayette is operating to capacity and will be continued until fall, when it will be merged with the Indianapolis factory

The Week in the Industry

Engineer — Dealer — Repairman — Garage



On the Lincoln Highway

Plans for the development of a great transcontinental route through central Colorado to form a link in the national highway are being carried out by the Lincoln Highway Association of Colorado. The upper illustration gives an excellent idea of the good roads in the Pike's Peak region, being a section of the Colorado Springs-Canon City state highway. The lower illustration is from a photograph taken in Ute Pass, just west of Colorado Springs and Manitou

SACKS Advertising Manager—C. O. Sacks, president and treasurer of the Rowland Advertising Agency, New York City, has accepted a position as advertising manager for Gray & Davis, Boston, Mass. He will enter upon his new duties July 1.

Eckler Promoted—C. E. Eckler has been promoted to manager of the Cadillac Auto Co. of Indiana, Indianapolis, Ind.

Richman Cole Factory Manager—J. F. Richman recently joined the Cole Motor Car Co., Indianapolis, Ind., as factory manager.

Strout Haynes Sales Manager—G. H. Strout has been appointed general sales manager of the Haynes Automobile Co., Kokomo, Ind.

Rose Pacific Coast Manager—L. H. Rose has been appointed Pacific Coast manager of the Lozier Co., with headquarters at Portland, Ore.

Manager Vancouver Winton—Miss Maude Matthews has been promoted to the position of manager of the Winton branch in Vancouver, B. C.

Opens Charging Plant—The Presto-O-Lite Co., Indianapolis, Ind., announces the establishment of a new branch office and charging plant at Des Moines, Ia.

Bosch Appoints Herring Company—The Herring Motor Supply Co., Des Moines, Ia., has been appointed distributor for the Bosch Magneto Co., New York City.

By Way of Correction—In the description of the Blazer horn in the March 13 issue of THE AUTOMOBILE the address should have been Waltham, Mass., instead of Cambridge.

Hemington Opens Advertising Agency—E. J. Hemington, for several years advertising manager of the Goodyear Tire & Rubber Co., Akron, O., has opened the Hemington Advertising Agency, Akron.

Borland-Grannis Moves—The executive offices of the Borland-Grannis Co., Chicago, Ill., have been moved from their Chicago retail sales rooms on Michigan avenue to their factory at 310 East Huron street.

Martin Resigns—H. F. Martin, who has been general sales manager of the Pennsylvania Steel Co., has recently resigned and has taken a similar position with the Eveland Engineering & Mfg. Co., Philadelphia, Pa.

New Agencies Established During the Week

PLEASURE VEHICLES

Place	Car	Agent
Aurora, Ill.	Pilot	E. J. Ellis
Bagdad, Fla.	Moon	C. M. Munson
Baltimore, Md.	Regal	Clark Motor Co.
Baltimore, Md.	Jackson	W. J. Meyers & Co.
Birmingham, Ala.	Buick	B. M. Braziel
Binghamton, N. Y.	Pilot	Cossitt & Manning
Bloomfield, Neb.	Apperson	J. Devier
Bradford, Pa.	Pilot	J. Rogerson
Brattleboro, Vt.	Pilot	F. W. Putnam
Canajoharie, N. Y.	Pilot	W. J. Roser
Carmi, Ill.	Moon	T. H. Land
Chelsea, Mass.	Pilot	Capt. J. H. Low
Chicago, Ill.	Haynes	Haynes Motor Car Co.
Clarinda, Ia.	Hupmobile	L. N. Cleveland
Claysville, Pa.	Pilot	E. D. Noble
Columbus, Neb.	Empire	Columbus Auto Co.
Corry, Pa.	Pilot	W. E. Marsh
Cos Cob, Conn.	Moon	J. M. Ulrich
Deadwood, S. D.	Cartercar	L. C. Page
Detroit, Mich.	Keeton	Whiston & Urborne
Easton, Pa.	Pilot	M. H. King
Emerson, Neb.	Moon	Linderink & Kerwin
Erie, Pa.	Keeton	Streuber-Mooney Co.
Fredericton, N. B.	Franklin	Smith Foundry Co., Ltd.
Gering, Neb.	Little	Fred Dooley
Grand Island, Neb.	Hupmobile	C. G. Ruenker
Hamburg, Ia.	Apperson	W. G. Fletcher
Helena, Ark.	Pilot	L. B. Davis
Hemingford, Neb.	Reo	C. B. Wildy
Hemingford, Neb.	Little	C. B. Wildy
Holyoke, Mass.	Pilot	W. D. Ballard
Holyrood, Kans.	Moon	G. G. Baker
Huntington, W. Va.	Moon	F. M. Hawkins
Indiana, Pa.	Pilot	I. L. Culp
Irvington, N. J.	Moon	F. W. Tidy
Joplin, Mo.	Moon	Joplin Supply Co.
Joplin, Mo.	Pilot	E. Barrett
Kansas City, Kans.	R-C-H	A. Garnier
Lincoln, Neb.	Empire	E. W. Fry
Long Pine, Neb.	Hupmobile	Culberson-Engle Co.
Masontown, Pa.	Pilot	Masontown Motor Car Co.
Memphis, Tenn.	Pilot	City Motor Car Co.
Milwaukee, Wis.	Pilot	J. H. Zirgler
Moneta, Ia.	Moon	Louis Ruwe
Murphysboro, Ill.	Pilot	G. E. Craine
Neeley, Neb.	Little	F. H. Bare
Neeley, Neb.	Reo	F. H. Bare
Newark, N. J.	Moon	G. Colyer & Co.
Norfolk, Va.	Pilot	C. B. Cole
Oakdale, Neb.	Little	Charles McKeen
Oakdale, Neb.	Reo	Charles McKeen
Oklahoma City, Okla.	Ohio	Carhart Motor Co.
Oswego, N. Y.	Pilot	E. E. Favreau
Otto, Pa.	Pilot	T. J. Ardinger
Pacific Junction, Ia.	Hupmobile	J. C. Stone
Pomona, Cal.	Moon	H. L. Wood
Pukwana, S. D.	Moon	D. M. Fell
Pender, Neb.	Moon	H. D. Rixen
Petersburg, Va.	Moon	W. P. Atkinson Co.
Philadelphia, Pa.	Pilot	Raymond McCormick
Plainview, Tex.	Pilot	W. C. Wright
Providence, R. I.	Pilot	H. E. Bradford
Rapid City, S. D.	Hupmobile	T. H. Randall
Richmond, Ind.	Pilot	McConaha Co.
Rochester, N. Y.	Pilot	Almy Auto Co.
San Antonio, Tex.	Imperial	Dickinson & Stark
San Francisco, Cal.	McFarlan	Benton Auto Co.
San Francisco, Cal.	Pilot	Henry Hagensen
Shelton, Neb.	Hupmobile	O. R. Winsett
Sheridan, Mo.	Empire	M. Long
South Bend, Ind.	R-C-H	E. H. Rambo
South Boston, Mass.	Pilot	I. H. White
South Manchester, Conn.	Pilot	P. G. Ferris
Springfield, Mass.	Buick	Springfield Buick Co.
St. Louis, Mo.	Davis	Meyers-Busch Motor Car Co.
St. Paul, Minn.	Nyberg	F. J. Beaurline
Toledo, O.	Pilot	G. H. Fisher
Torrington, Conn.	Pilot	I. E. Mallette
Troy, N. Y.	Pilot	I. J. O'Hare
Washington, D. C.	Chandler	Miller Co.
White Plains, N. Y.	Pilot	F. H. Briggs

COMMERCIAL VEHICLES

Place	Car	Agent
Boston, Mass.	Stewart	Harris & Sons
Indianapolis, Ind.	Commerce	Sterling Motor Car Co.
St. Paul, Minn.	Sternberg	E. F. Morgan

Automobile Tire Station Opened—A tire salesroom and repair shop known as the Auto Tire Station has been opened at 9 Park street.

To Build Birmingham Garage—The contract has been let for the erection of a garage for the Birmingham Motor Co., Birmingham, Ala.

Krit Philadelphia Agency Moves—The Philadelphia, Pa., branch of the Krit Motor Car Co. has moved to larger quarters at 256 North Broad street.

Buys Out Business—Arthur H. Chandler has purchased the garage business of David Brown, Jr., at Plymouth, Mass., and will continue it on a larger sacle.

Supply Station Established—An adjustment depot, supply station and office have been opened at 107 Albany avenue by the B. F. Goodrich Co., at Hartford, Conn.

Miller Heads Alco Sales—E. Spencer Miller has been placed in charge of sales of Alco pleasure cars at the Philadelphia, Pa., branch of the American Locomotive Co.

Decker Penn Sales Manager—G. W. Decker, for several years the general manager of the Erie Rubber Co., is now the sales manager of the Penn Auto Co., Erie, Pa.

Russell Establishes Taxicab Line—W. E. Russell has established a taxicab and transportation line at Fond du Lac, Wis., and will soon be in the market for additional cars.

LaCrosse Dealers Association Formed—Fifteen motor-car dealers of LaCrosse, Wis., have banded together for mutual benefit and organized the LaCrosse County Automobile Dealers Assn.

Will Cost $50,000—The Packard Motor Car Co., Detroit, Mich., is erecting salesrooms and a service station in Milwaukee, Wis., which will cost $50,000. H. P. Robinson will be manager.

Back on the Job—C. T. Lawton has resumed the position of sales manager of the Bi-Motor Equipment Co., at Boston, Mass., after an absence of some months spent in developing the business elsewhere.

Has His Own Garage.—A. E. Riggs, formerly with the Harvard garage in Cambridge, Mass., has just gone into business for himself and he has opened the Austin garage and repair shop at 139 Austin street.

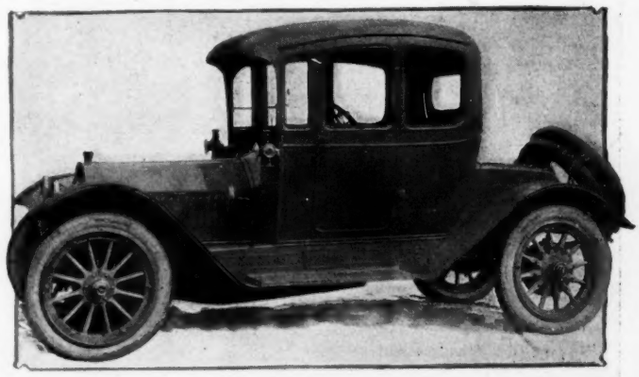
Continental Truck Moves—The Continental Motor Truck Co., Superior, Wis., has been obliged to move into larger quarters to cope with its growing business. The company has leased for a term of years the Carey building at Tower avenue and Nineteenth street.

Baltimore Wants More Automobiles—The purchase of two additional automobiles was authorized by the Baltimore, Md., board recently. One is to be bought by Building Inspector Stubbs and the other by Electrical Engineer Thomas. Each department is to get a Studeaker car at a cost not to exceed $1,290.

Harrisburg Automobile Field Growing—Automobiles have added forty-five buildings, worth about $45,000, to Harrisburgh, Pa., during the past year according to figures secured from the office of the building inspector. From April 1, 1912, until April 1, 1913, permits for the erection of garages valued anywhere from $50 to $20,000 have been issued.

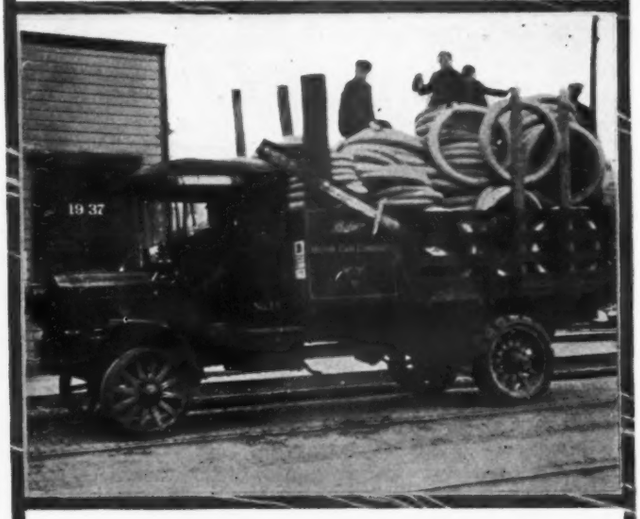
Receives Stewart Patrol Wagon—Delivery has been made in New Orleans, La., of a new motor-driven patrol wagon. The new car will accommodate eleven passengers. The car was furnished by the Stewart factory, Buffalo, N. Y.

Alterations Double Goodyear Space—Alterations now in progress will on completion provide nearly double the present space of the Hartford, Conn., branch of the Goodyear Tire & Rubber Co. An adjoining store formerly used by Kilby & Barrett, the Matheson representatives has been acquired.



Locomobile coupé mounted on little six chassis, adapted from the seven-passenger Berline. Shows close adherence to the current foreign style, which for this year presents all closed car with roof lines unbroken by dormer effects and with no angular breaks at the sides or back. All windows may be readily lowered, giving the advantages of an open car in warm weather

Typical scene in Dayton, O., during the flood, showing house which has been set loose from its foundation



Tires were donated liberally for relief work cars during the flood which recently devastated Dayton, O.

Another use to which the Packard truck was applied during the Dayton flood. Carting away dead animals

Firestone Tire Moves—The Firestone Tire & Rubber Co. has just moved into a new fireproof garage on West Central street, Boston, Mass., 55 by 90 feet.

Hotel Garage Now—F. W. Trowbridge, proprietor of the Knox House at Thomaston, Me., has just bought the Stackpole buildings on Green street which he will convert into a garage to run in connection with his hotel.

With Republic Company—H. E. Parent, formerly in charge of the repair department of the Cadillac agency in Boston, Mass., has resigned to take a similar position with the Republic Motor Co. there, that handles the Chevrolet Six and the Little car.

Harris Goodrich Washington Manager—F. L. Harris has been appointed manager of the Goodrich tire branch in Washington, D. C., succeeding B. A. Thurin, who has been transferred to the Goodrich factory. Mr. Thurin is to be appointed the Goodrich manager in one of the Middle West cities within the next few weeks.

New Salesroom Opened—The Myer Abrams Co., agent for the Lauth Juergens trucks, has turned a portion of its store on Portland street, Boston, Mass., into a salesroom for trucks and it has two machines there now. The reconstruction of its service station in Cambridge, on Vassar street, that was destroyed by fire a few weeks ago, has been finished and the company is now occupying it again.

Bowman Assistant Sales Manager—F. P. Bowman, formerly Eastern sales manager of the Schacht Motor Car Co., Cincinnati, O., has become assistant sales manager for the Norwalk Motor Car Co., Martinsburg, W. Va., with headquarters at Chicago, Ill., and will have charge of the sales in the States of Ohio, Indiana, Illinois, Minnesota, Michigan, Iowa, Kentucky and Wisconsin.

Automobile Incorporations

AUTOMOBILES AND PARTS

Berlin, Conn.—Berlin Auto Co.; capital, $25,000; to deal in automobiles. Incorporators: J. C. Lincoln, R. O. Clark, E. G. Robbins.

Boston, Mass.—M. B. M. Motor Co.; capital, $30,000; to deal in automobiles. Incorporators: G. W. Bollinger, E. H. Marsters, C. A. Malley.

Boston, Mass.—Curtis Motor Repair Co.; capital, $2,000; to deal and repair in automobiles. Incorporators: G. E. Crampton, A. W. Crampton, R. W. Curtis.

Buffalo, N. Y.—Ivey Motor Truck Co.; capital, $10,000; to deal in motor engines, etc. Incorporators: C. A. Ivey, A. L. Rusling, F. S. Heller.

Chicago, Ill.—Haynes Motor Car Co.; to deal in automobiles. Incorporators: A. E. Starbuck, Webb Jay, A. G. Seiberling.

Cleveland, O.—Standard Tire & Repair Co.; capital, $10,000; to deal in and repair self-propelled vehicles, machinery, etc. Incorporators: G. G. Moisey, O. A. Erb, L. T. Fay, R. F. Moisey, F. V. Brady.

Cleveland, O.—Krit Motor Sales Co.; capital, $10,000; to deal in automobiles. Incorporators: R. Scott Smith, C. A. Smith, M. A. Sell, C. B. Tenpler, D. Hakes.

Detroit, Mich.—Gilmore Motor Mfg. Co.; capital, $35,000; to manufacture motors. Incorporators: George Gilmore, M. A. Shaw.

Lowell, Mass.—Lowell Buick Co.; capital, $15,000; to deal in automobiles. Incorporators: F. B. Emerson, M. W. Hale, Jr., D. D. O'Dea.

Montreal, Que.—Canadian Drednot Motor Trucks, Ltd.; capital, $250,000; to deal in motor trucks.

Newark, N. J.—Smith Motor Car Co.; capital, $25,000; general automobile business. Incorporators: J. L. Smith, L. W. Smith, J. W. Mason.

New York City—Indiana Motor Truck Sales Co.; capital, $10,000; to manufacture and repair automobiles. Incorporators: W. A. Schwarzkoff, Rosalind Lovy, L. C. Knoegel.

New York City—Still's Automobile & Accessories Co.; capital, $10,000; to deal in automobiles and accessories. Incorporators: J. H. Still, G. M. Still, G. E. Still.

Portland, Ore.—Oregon Motor Car Co.; capital, $10,000; to deal in automobiles. Incorporators: E. R. Winchell, Robert Tucker, F. F. Griggsby.

Portland, Ore.—Ford Taxicab Corp.; capital, $100,000; to manufacture, sell and deal in automobiles. Incorporators: N. R. Dexter, J. B. Reed.

Toledo, O.—Stewart Auto Sales Co.; capital, $10,000; to deal in automobiles. Incorporators: J. A. McMichael, L. E. Flory, E. A. Hudson, J. H. Baumgardner, J. W. Lane.

Yonkers, N. Y.—Yonkers Auto Renting Co.; capital, $3,000; to rent automobiles. Incorporators: William Lowa, Jr., Carl Lowa, Carolyn Lowa.

New York City—Normal Automobile Station; capital, $10,000; to carry on a garage business. Incorporators: J. F. Bokelman, A. Bokelman, Edward Gantner.

New York City—Cox's Pneumatic Cushion Co.; capital, $1,000; to manufacture rubber goods and devices used by automobiles. Incorporators: C. H. Cox, Henry Seibel, F. R. Hoopes.

New York City—Allied Motor Accessories Co.; capital, $10,000; to deal in accessories. Incorporators: Annie Minford, G. X. Melbourne, A. K. Harroun.

New York City—Paul's Used & Rebuilt Auto Co.; capital, $5,000; to repair automobiles. Incorporators: G. W. Miller, August Paul, Jr., Albert Sigel.

New York City—National Tissue Advertising and Novelty Co.; capital, $50,000; to deal in automobile tires, axles and other patented articles. Incorporators: Joseph Berkowitz, Eugene N. Sanctuary, C. D. Stillman.

New York City—East Side Auto Co.; capital, $3,000; to carry on a garage business. Incorporators: Morris Eder, Morris Levine, Bertha Levine, Joseph Truck.

Creditors Receive Checks—Creditors of the Flanders Mfg. Co., Pontiac, Mich., received on April 16 checks from the Detroit Trust Co., receiver for the Flanders concern, for 25 per cent of their claims.

Lasher Advertising Manager—H. P. Lasher, formerly with the Beckwith Advertising Agency, Detroit, Mich., has taken the position of automobile advertising manager of the Philadelphia, Pa., Press.

Robartes and King Transferred—F. W. Robartes, manager, and E. W. King, assistant manager, of the Locomobile branch in Washington, D. C., have been transferred to the Locomobile branch in Atlanta, Ga.

Springer President Insurance Company—W. H. Springer is president of the Auto Mutual Insurance Co., Omaha, Neb. This concern is based on the Ohio plan, insuring members against liability from fire or theft.

Blakely with Tribune—H. H. Blakely, former assistant purchasing agent for the Abbott Motor Co., Detroit, Mich., and previous to that holding a similar connection with the R-C-H Corp., Detroit, has been made purchasing agent for the Tribune Motor Co., that city.

Garage Changes Hands—The garage business conducted at Great Barrington, Mass., for the past 2 years has been sold by George M. Bullock, its proprietor, to Elton S. Jones of Riverton, Conn. It is one of the largest garages in the western part of Massachusetts.

Open Repair Shop—Fred Leonhardt and G. A. Woodward have opened a repair shop under the firm name of Leonhardt & Woodward at Toledo, O. The plant has been well equipped with machinery and appliances to handle the repair work and adjustments on all makes of automobiles.

Automobile Incorporations

SCHENECTADY, N. Y.—Tri-City Auto Transit Co.; capital, $5,000; to carry on an automobile bus line. Incorporators: W. L. Coolidge, Bert Carl, J. R. Parker.

WORTHAM, TEX.—Wheatham Auto Supply Co.; capital, $600; to deal in accessories. Incorporators: A. N. Weaver, Roy Simmons, K. W. Sneed.

CHANGES OF NAME AND CAPITAL

LOS ANGELES, CAL.—Brown-Symonds Co.; change of name to the Walter M. Brown Co.

SAN ANTONIO, TEX.—San Antonio Auto Club House Co.; capital increased to $20,000.

TOLEDO, O.—Rapp Mfg. Co.; change of name to the Toledo Spark Plug Mfg. Co.

GARAGE AND ACCESSORIES

BROOKLYN, N. Y.—Haslup Brass Mfg. Co.; capital, $25,000; to deal in hardware, automobile accessories, etc. Incorporators: E. W. Haslup, F. D. Glover, Joseph Scholl.

BROOKLYN, N. Y.—Self-Generating Motor Co.; capital, $250,000; to deal in automobile appliances. Incorporators: O. G. Holzhausen, R. T. Maul, H. B. Wood.

BROOKLYN, N. Y.—Sumner Garage and Sales Co.; capital, $5,000; to repair automobiles. Incorporators: R. W. Kathan, C. J. Gillem, E. H. Schmidt.

CHICAGO, ILL.—Specialty Sales & Mfg. Co.; capital, $5,000; to manufacture automobile and motor-cycle accessories. Incorporator: William Klein.

COLUMBIANA, O.—The Columbia Rubber Co.; capital, $100,000; to manufacture and deal in crude rubber and automobile tires and supplies. Incorporators: E. L. Henderson, A. E. Albright, H. J. Richards, J. H. Richards, T. Price.

DETROIT, MICH.—Crescent Co.; capital, $200,000; to manufacture automobile starting devices. Incorporators: H. H. Potter, F. W. Owen.

EAST PALESTINE, O.—McGraw Tire & Rubber Co.; capital, $1,000,000; to manufacture and deal in rubber tires and rubber goods and materials and products of every kind and automobile and motor vehicle accessories. Incorporators: J. C. Chaplin, C. H. Bolton, J. S. Wilson, George Flaccus, E. G. McGraw, L. H. McGraw, John Morgan, R. F. Taggart, R. B. Taggart, J. C. Chamberlin, H. C. Fraser, C. L. Merwin.

KANSAS CITY, MO.—Liquid Tire Co.; capital, $125,000; to manufacture a tire filler. Incorporators: C. S. Wright, G. L. Schofield, C. W. Prewett.

LORAIN, O.—Troike Muffler and Mfg. Co.; capital, $20,000; to manufacture mufflers for gas and gasoline engines. Incorporators: Ernst Troike, Paul Troike, George L. Deeher, G. L. Clitsch, A. H. Babcock.

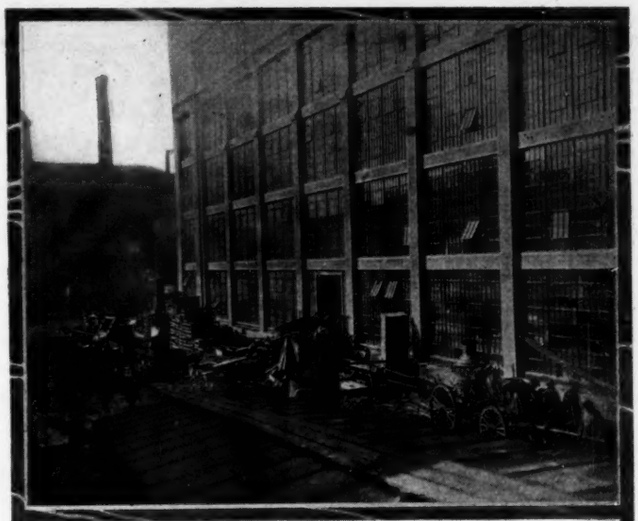
LOUISVILLE, KY.—Mindease Co.; capital, $100,000; to manufacture and distribute Mindease, a composition of chemicals and ingredients, as a substitute for air in tires. Incorporators: M. J. Hickey, W. C. Broh, T. A. Peake.

MARION, O.—Marion Punctureseal Co.; capital, $5,000; to manufacture and deal in a substance for mending rubber tubing. Incorporators: S. J. Martin, F. P. Beck, I. C. Millison, J. B. Gunder, C. C. Miller.

MOUNT VERNON, N. Y.—Mount Vernon Co-Operative Garage Co.; capital, $3,000; to carry on a general garage business. Incorporators: Martin Liffgren, Robert Jacobsen, Lucy Jacobsen.

MOUNT VERNON, N. Y.—Brennan's Auto Garage; capital, $2,000; to carry on a garage business. Incorporators: A. J. Brennan, C. F. Renning, W. C. Clark.

NEW YORK CITY—Peerless Tire Co.; capital, $15,000; to manufacture automobile tires. Incorporators: Michael Schiavone, Louis Schiavone, Antonio Caropreso.



At the Dayton Electric Laboratory Co., Dayton, O., after the flood. Donkey engine and fire engine pumping

Effect on Dayton property of the flood. Steel tank left in the street. Note condition of street

Relief work with a Speedwell. This car was courier for the military authorities between Dayton and Miamisburg

Automobile Patents

SHOCK Absorber Construction—In which an air-bag between the axle and the body assists the spring suspension in absorbing the effects of road inequalities.

Fig. 1 shows the subject matter of this patent, a shock absorber, which consists principally of an air-bag A placed on the axle of an automobile. A cross-bar C engages the air-bag and presses it against the axle when it is moved. By means of members M the cross-bar C is connected with the body of the car in such a manner that the bag A must absorb shocks which tend to be transmitted from the axle to the body. A rebound absorber R is in place near each end of the cross-bar C, consisting of a piston connected with C through M and moved by it. A cylinder is provided for each of the pistons to work in, being open to the atmosphere at one end. A valve is arranged at the opposite end of each cylinder, this valve being formed with a vent and adapted to open freely when the piston is moved in one direction and to close in response to opposite movement of the piston, the only possible escapeway for the air being through the vent.

No. 1,058,253—to Thomas J. Mullen and Thomas F. Brennan, New Brighton, N. Y. Granted April 8, 1913; filed July 19, 1911.

Tire Tube and Signal—Consisting of an inflation valve and a sound signal which is operated when the air pressure in the inner tube falls to a certain point.

The device described in this patent is seen in Fig. 2. It consists of a pneumatic tire and a rim for carrying the same. A tube T extends radially through the rim and communicates with the interior of the tire. A plunger P extending through the tube is movable longitudinally through it. Means are provided for rendering the plunger airtight with relation to the tube T. The plunger carries a valve V to prevent the escaping of air when the latter is forced into the tire through the plunger. The plunger also carries a signaling device acting when the tire is deflated to a certain degree.

No. 1,058,571—John Emerson Featherston, Valley City, N. D. Granted April 8, 1913; filed September 27, 1912.

Tire-Deflating Tool—Being in place in the inflation-valve tube and operable from outside by pressure upon an arm.

In Fig. 3 the tire-deflating tool described in this patent is illustrated. This tool consists of a pair of spring-tensioned jaws J which are pivoted together and end in handles so formed as to be able to clamp the threaded extension E of a valve casing of a pneumatic tire. The jaws J have threaded linings of a material softer than the valve substance, insuring the firm gripping action of the jaws on the casing. One of the jaws has an aperture A in which the angular end of a spring arm S is secured, its free portion terminating into an offset extension O formed with threads. A socket member T is threaded to the extension O to receive an extension stem W of a valve in the casing mentioned, thereby holding the valve unseated. An eye-loop L is secured to one of the jaws for guiding the arm S. When the latter's angular end which protrudes through A is depressed, the valve is unseated, permitting the inflating air to escape.

No. 1,058,557—to Michael Lewis Connor, Pony, Mont. Granted April 8, 1913; filed September 12, 1912.

Automobile Shock Absorber—In which the main springs are assisted in their action by a cross spring and a cushion between the latter and the body.

In this shock absorber, Fig. 4, the main springs S are combined with a cross spring T connected to it by universal-joint means which consist of a pair of pivotally connected links at each end of T; the upper links hang from the ends of S and are movable in the planes of these springs, while the lower links are connected to the spring T and are movable in its plane. A cushion element C bearing against the car frame assists the springs and a shock-transmitting element E works between C and T; E consists of a transverse spring bar which is secured at its center to T and is connected at its ends by the car frame by means of links.

No. 1,058,413—to Walter H. Cook, New Orleans, La. Granted April 8, 1913; filed September 10, 1912.

Automobile Muffler—Consisting of a conico-helically formed exhaust pipe.

This muffler, Fig. 5, comprises a cone-shaped discharging chamber open at its base, so as to form an ejecting mouth larger than the area of cross section of the exhaust duct connected to its inlet. A receiving chamber has an ejecting mouth which opens axially into the apex of the discharging chamber mentioned, and an exhaust pipe P which is coiled conico-helically to form the curved inclosing wall of the discharging chamber. The exhaust duct communicates with the receiving chamber so as to discharge the gases tangentially into the same.

No. 1,058,393—to Louis Vaughan, Blair, Neb. Granted April 8, 1913; filed August 14, 1911.

Air-through-Fuel Carbureter—In which the air is forced through the gasoline in a variable number of streams.

This carbureter consists of a carbureting chamber to which liquid fuel may be supplied, in combination with means for driving a number of air streams into the fuel. The chamber has an outlet duct or chamber for receiving the mixture so produced in the carbureting chamber. An obstruction or mixer is interposed between the two chambers and a relief valve in the outlet duct forms also an auxiliary air valve.

No. 1,058,407—to William J. Candlish, Chicago, Ill. Granted April 8, 1913; filed March 6, 1908.

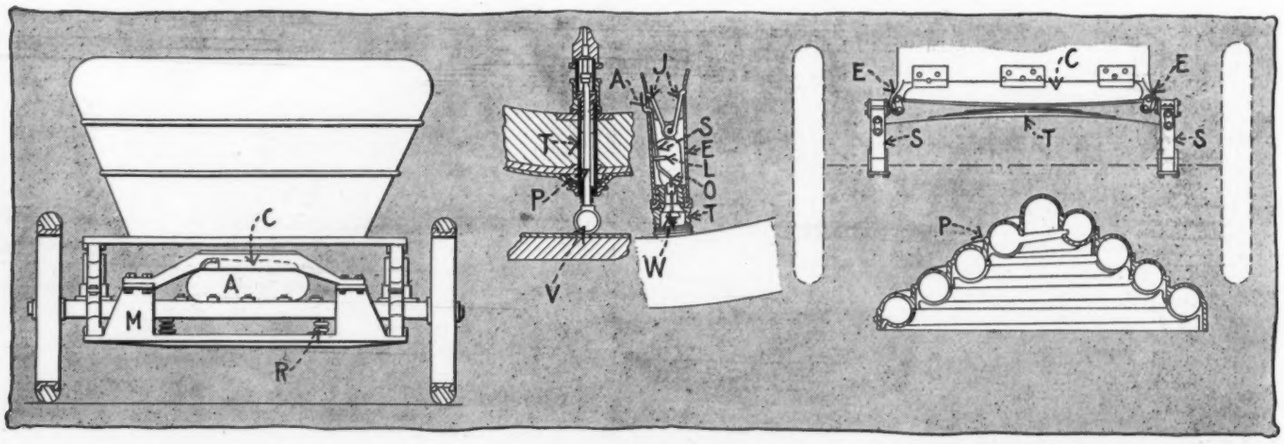


Fig. 1—Mullen-Brennan shock absorber. Fig. 2—Featherston tire-deflation signal. Fig. 3—Connor deflating tool. Fig. 4—Cook shock absorber. Fig. 5—Vaughan muffler